

Sheltering in Place:
The Limits of Integrative Bargaining Following Industrial Accidents

by

Gregg P. Macey

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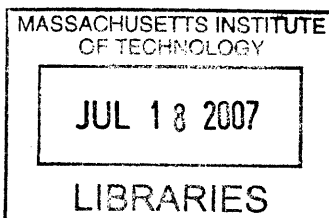
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Signature of Author: _____
Department of Urban Studies and Planning
April 18, 2007

Certified by: _____
Lawrence Susskind
Ford Professor of Urban and Environmental Planning
Thesis Supervisor

Accepted by: _____
Frank Levy
Daniel Rose Professor of Urban Economics
Chairperson, Committee for Graduate Students



MIT ROTCH

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ABSTRACT

This study grew out of an interest in environmental justice and the unique problems faced by neighborhoods located near petrochemical facilities. It also focuses on negotiation theory and how it can be applied under an increasingly diverse array of circumstances. I sketch the roots of the concept of integrative bargaining and how it emerged as a powerful yet limited tool for meeting the interests of stakeholders in multi-party contexts. Specifically, I demonstrate how research into the structure of conflict, with origins in contract and game theory, encouraged a new profession that focuses much of its time, paradoxically, on matters of agency, such as the strategic elements widely viewed as conducive to a Pareto efficient outcome. In an effort to encourage a renewed focus on structure, I show how in a highly institutionalized setting, which for my dissertation included the causes and immediate consequences of an accidental toxic emission by a chemical processing facility, much of the integrative potential of the negotiations that follow is removed from potential discussion or even discovery before mediators and the parties involved begin to address root causes. New roles for mediators, and why it is as important to focus on limiting the narrowing effects of structuration as it is to try and expand the initial offer space, are discussed. Data for my dissertation include semi-structured interviews with over 90 agency and industry representatives, residents and community organizers, and the lawyers and mediators who were also a part of the conflicts that followed accidents such as the Unocal Catacarb spill. I also collected primary documents, including environmental data, deposition transcripts analyzed to determine the organizational roots of the accidents, plant management and government agency records, media accounts, and drafts of community-corporate agreements.

Thesis Supervisor: Lawrence Susskind

Title: Ford Professor of Urban and Environmental Planning

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Chapter 1

Introduction

In 1973, there was an explosion on my street. A family, and one of my ex-students was burned by an explosion that was caused by a young man whom I taught. He was cutting grass in his yard and his lawnmower hit one of the pipelines, ethylene pipelines that somehow, some way connected with Shell Chemical that's directly in front of my house... it ignited, and there were two lives that were lost, and it was the lady who was in the house sleeping, the house caught afire, and the young boy who was on fire as he cut the grass. (Interview with member, Concerned Citizens of Norco, Diamond, Louisiana, February 28, 2001)

The literal extension of a Shell Chemical facility into the yards of nearby single family homes, described above by a long-time resident of a small town along the Mississippi River, would undoubtedly be dismissed by many as an exaggeration, misunderstanding, or at worst, an anomaly. Perhaps there are isolated instances where the boundaries between some of the 278,000 chemical plants and transport, treatment, storage, and disposal facilities in the United States and residential areas are blurred to an uncomfortable degree.¹ Maybe some jurisdictions lack the sophistication or desire to address these facilities, which were grandfathered into their current location and size through loopholes in state and federal environmental statutes.² Indeed, interviews with planners along the very industrial corridor in which Shell Chemical exists, a heavy concentration of petrochemical facilities that stretches from Baton Rouge to New Orleans, Louisiana (“known as “Cancer Alley”),³ revealed that planners did not see a role for land use regulations or comprehensive planning in the protection of residents from environmental pollution. For many of us, it would be all too easy to dismiss “Cancer Alley” and other such places as vestiges of another time, unfortunate but unusual examples of pockets of the country holding on to a bygone industrial era begun in the 1890’s.

Yet a more purposeful investigation of the lives, stories, and claims of people in Norco and similar environs elsewhere reveals that the commingling of residential and industrial zones and its effects on poor minority populations was far from the exception in our nation's history: it was standard practice and in many places, it was the law. In March 1927, Texas called for all municipalities to delineate separate residential districts based on race.⁴ Winston-Salem, North Carolina, Oklahoma City, and Apopka, Florida, followed suit in adopting racial zoning ordinances in 1930, 1933, and 1937, respectively.⁵ Racial segregation through the use of zoning policy has also been documented in such cities as Richmond, Norfolk, Roanoke, and Portsmouth, Virginia; Birmingham, Alabama; Atlanta, Georgia; Louisville, Kentucky; St. Louis, Missouri, Indianapolis, Indiana; New Orleans, Louisiana; and Dallas, Texas.⁶ In addition, the first zoning ordinances to be enacted in San Francisco and New York City were designed to maintain segregated neighborhoods (San Francisco prohibited the operation of laundries in residential areas in order to keep Chinese people from living in white communities).⁷ Manufacturing was often introduced to or encouraged in the resulting sections of cities that housed minority populations. Minority districts were used as buffer zones between industrial land uses and white residential areas. Planners developed interesting guidelines such as the notion that multifamily (disproportionately low-income and minority) housing was appropriate to site near manufacturing complexes.⁸ Much of our nation's public housing developments have been built on comparatively cheap land near petroleum refineries, landfills, and other undesirable land uses. And in many cases, industrial zones were overlaid on racial districts.⁹

For one who has never been to places such as Norco, Louisiana (which includes the former plantation communities of Diamond and New Sarpy, both settled before the arrival of the New Orleans Refining Company from which Norco gets its name), the first moments spent in these neighborhoods can be an exercise in sensory overload. In Norco, symbols of risks to human health abound: odors, repetitive noises, loudspeakers, flaring, “blazing” (high flares), and imposing physical structures such as storage tanks are ever-present. In addition to these and other “mundane stressors” to which residents attempt to habituate, families living in these communities are regularly subjected to industrial accidents that result from the operation of such massive, complex facilities. Speaking with local parish officials, one would never know the frequency of these accidents or the level of concern they generate among the general population:

For the most part if there is an industrial accident in a facility of the nature we have here, usually they are all self-contained, usually their internal systems, their safety and fire systems have always managed to handle it (Interview with St. Charles Parish official, April 15, 2001)

While such a level of trust in a mature industry such as petroleum refining is common, chemical, refinery, and storage tank accidents “are plentiful, and serious enough in terms of catastrophic potential.”¹⁰ Indeed, accident rates in Saint Charles Parish are high. For instance, between January 1998 and June 1999, the Shell Norco complex averaged over 3.5 accidents per month that resulted in a chemical release.¹¹ The Orion refinery experienced 40 accidents between May 1 and November 12, 2000.¹² In addition, the Norco and New Sarpy facilities are prone to vast quantities of fugitive emissions, which stem from thousands of pumps, valves, and other elements of a chemical facility that degrade or malfunction.¹³ Shell Chemical alone has more than 200,000 emissions points. Failure to adequately check these points at the Shell Norco complex has been extensively documented.¹⁴

When an accident occurs in a community such as Norco, a series of routine responses are set in motion. The politics of risk management and communication in Norco proceed according to distinct ritualistic acts by government and industry officials. Information available to the public is limited. The Parish did not release a disaster plan detailing worst case scenarios for its facilities until January, 1999 (submittal of these plans by June 1999 was required by the EPA in June 1996).¹⁵ By 1997, Saint Charles Parish had established three ambient air monitoring sites to collect measurements of air pollutant concentrations.¹⁶ However, these facilities are located far away from such facilities as the Shell Norco manufacturing complex (in Destrehan, Hahnville, and Luling), and measure a severely limited range of pollutants (PM₁₀¹⁷/TSP¹⁸, Ozone, and PM₁₀/TSP, respectively). None of the toxic pollutants that are produced by petrochemical plants or that would be of concern to the residents of Norco or New Sarpy during an accidental release are monitored by state or federal agencies. Nor are there any existing requirements under the Clean Air Act for the monitoring of toxic air pollutants.¹⁹ To the present, the Parish does not play a role in environmental enforcement and compliance and is reliant on the state Department of Environmental Quality for such actions.²⁰ Citizen complaints are forwarded to an Emergency Operations Center, which sends information to the state police who in turn work with appropriate state and federal agencies.

So what happens during a release, or “episode” as it is referred to by the state? Below are contrasting accounts of a recent accident to occur in Norco, Louisiana:

Shell's account:

0800 – over-pressure of a small vessel occurred at the resins unit at Shell Chemical
0815 – event declared unusual and on-site emergency response team activated
0827 – event upgraded to an alert level, which tells the DEQ and parish officials to assemble their personnel
0827-0850 – nearby schools told to shelter in place due to the potential for flying debris from a rupture. State police notified. DEQ director called for a rerouting of busses to a high school outside the potentially impacted area. DEQ informs schools next to plant to shelter in place.
0935 – state police arrive at plant
0945 – a message is sent over an automatic phone line to Norco residents.
1005 – DEQ officials arrive to take air samples and are informed that there was no release. DEQ officials decide not to take air samples.
1052 – event is downgraded to an unusual event.
1140 – an all clear is declared.
1500 – fliers are distributed throughout the community²¹

Norco resident's account:

8:30 a.m. – a cloudy mist descends upon residents of Washington Street in Norco, LA.
9:35 a.m. – a representative from Shell travels into the community warning residents to keep their doors and windows closed and to stay inside.
3:30 p.m. – another representative passes out fliers announcing that the emergency was over and there were no chemical releases to the community²²

There are subtle differences in the descriptions of an uncontrolled reaction in a batch resins unit at Shell Chemical by company officials and a local resident. The militaristic set of responses in the first account is used by Shell officials to suggest that emergency response plans in place with the Parish and State worked as planned. It included steps taken to change the designation of the accident, escalating and de-escalating from “unusual” to “emergency” to “under control” and finally “all clear.” A series of notification steps were taken to comply with regulations governing the facility’s use of hazardous materials. DEQ officials responded to one of these calls, and declined to take canister air samples based solely on Shell claims. While procedures were undertaken and documented by the relevant authorities, residents experienced roughly six hours of uncertainty, fear, and silence. What role were residents given during this time? As is standard practice under such circumstances, they simply responded to instructions given to them one hour after a “black cloud” was seen “walking” across lawns of the homes on

Washington Street at 8:30 in the morning.²³ “Shelter in place,” they were told: seek the nearest building, seal off potential sources of air, shut your windows and doors, turn off your air conditioner (if you have one), and wait.²⁴ The “duck and cover”-like qualities of this approach to emergency planning are striking. In a low-income community consisting of aging, dilapidated, wooden-framed homes, residents are given the impossible task of sealing themselves inside, and the disempowering task of remaining completely reliant on the assurances of industry (and occasionally state) officials, whose common refrain is to give an “all-clear” announcement or siren several hours after the start of an accident. Often the potential for toxic releases is ruled out as a possibility when an accident occurs. If penalties are administered for an accident release, they are minimal and fail to provide incentives to even temporarily reduce production rates (penalties resulting from Notices of Violation average less than \$1,000 in some states).²⁵

Not surprisingly, residents of isolated, low-income, minority communities have begun to take matters into their own hands in response to industrial accidents. They have begun to recognize that the state is not nearly as omniscient as imagined when it comes to answering the simple questions that arise in the event of an incident at a neighboring facility: What chemicals have been released? Are they dangerous? Will they combine to form unanticipated compounds either in the facility or in the open air? In what concentrations will they accumulate on residential streets, and how long will they persist in the air, water, and soil? Are there risks of domino effects at the facility caused by the close proximity of other units? Are there appropriately trained, staffed, and notified emergency response teams and services in the area? How can all who share a stake in the outcome of such regular incidents learn from this accident and improve public safety and

quality of life? Lacking answers to such questions, local residents have reasserted their collective security needs and right-to-know as spelled out in the Emergency Planning and Community Right-to-Know Act (EPCRA),²⁶ while developing innovative right-to-inspect and other citizen participation mechanisms that they have tried to implement through community-corporate negotiations with targeted facilities. Residents have organized around industrial accidents, forming scores of community-based organizations that have moved into areas that were previously the sole purview of regulatory agencies, such as environmental monitoring and development planning.²⁷ They have established new initiatives for collaborative environmental assessment, including efforts to monitor environmental conditions through use of “bucket brigades,” “spill teams,” “flare cams,” “reactant bags,” and other low-tech strategies,²⁸ to deliberate over desired pollution levels and other concerns through “good neighbor agreements,”²⁹ and to engage government agencies through sophisticated uses of Toxics Release Inventory data.³⁰ These attempts to supplement or even rethink traditional command-and-control environmental regulation, spearheaded by members of environmentally overburdened communities, are a direct indictment of existing responses to accidents and attempts to rationalize the continued operations of facilities that by today’s standards would not be allowed to cast such long shadows over homes, schools, and playgrounds.³¹

Indirectly, such actions also constitute a scathing critique of scholarship and theory-building in the area of environmental justice research. Social scientists, armed with statistical analysis software and gigabytes worth of spatial and census data, have seemingly exhausted the possibilities presented them. We have demonstrated substantial effects of environmental pollutants on human health, estimating some 60,000 annual air

pollution deaths in the United States³² and linking cancer mortality with the location of chemical industries.³³ We have isolated minority and income variables and shown that race is a strong predictor of the location of hazardous waste facilities in certain cities,³⁴ the Southeast,³⁵ and across the contiguous 48 states.³⁶ And we have more recently explored the power of racial variables to predict health effects and environmental quality for such wide-ranging matters of concern as air quality,³⁷ childhood asthma,³⁸ elevated blood lead levels,³⁹ effluent from the hog industry,⁴⁰ and even indoor cockroach allergen levels.⁴¹ These and dozens of other studies have shed light on distributive inequities and their role in explaining disparities in health outcomes among minority populations.⁴² But while this brand of scholarship was at first necessitated by resistance to the notion of environmental racism and has been useful in shifting attention, policy, and resources,⁴³ some question its utility in getting to the heart of the matter: the multiple, overlapping, and sometimes hidden forces that lead to disproportionate exposure to environmental harms, and more importantly, appropriate responses. Pulido summarized the shortcomings of this research:

The first “racial pitfall” in most work on environmental racism is the assumption that racism is a specific thing whose effects can be neatly isolated. This assumption exists across disciplines and has left the strongest imprint on urban poverty debates. Within environmental racism research this belief is evidenced, for example, by regression analysis, which seeks to determine which variable is most strongly correlated with particular outcomes... While it may be possible statistically to separate and analyze “racial” and income groups, such a procedure does not necessarily help us understand the racialized nature of our economy, including the process of class formation, the division of labor, and poverty... It suggests that racism can be eliminated on its own because it is readily extricable from everything else⁴⁴

Academics continue to try to prove (and disprove⁴⁵) the extent and forms of environmental burdens borne by low-income, minority populations. At the same time, community organizing and the gathering and deployment of new forms of environmental data by local residents have led to a surge in opportunities to meet face-to-face with the

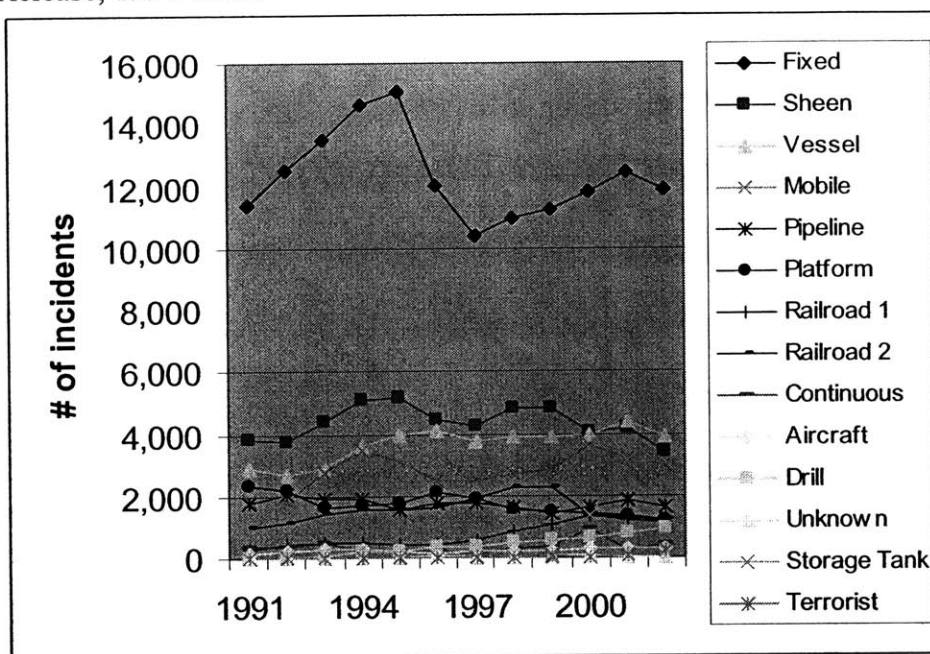
perpetrators of industrial accidents, either in a court of law, along picket lines, or across the table from industry and agency representatives in board rooms, church basements, and other meeting spaces. My dissertation considers negotiations that occur when the perpetrators of industrial accidents are bound by permitting authorities to deliberate with residents, forced to consider settlement options when their probability of success on the merits is limited during litigation, and encouraged to remove attention focused on their operations by sophisticated data employment and media strategies.

Why Focus on Industrial Accidents?

The experience of Norco residents during accidental releases is mirrored in many regions of the country and is far from infrequent: from 1988 to 1992, there were more than 20 chemical accidents per day, totaling over 34,500 accidents resulting in the release of a reportable quantity of one or more toxic chemicals.⁴⁶ In 1991 alone, the National Response Center received over 16,300 calls reporting the release or potential release of a hazardous material.⁴⁷ Such numbers are misleading, as not all hazardous chemicals or facilities that handle them are regulated. While there are a number of data sources for “chemical incidents,” no uniform definition exists across agencies of the federal government for the term. In addition, the data that are available suffer from gaps, duplications, and inaccuracies. Finally, there is no legal requirement for the reporting of all chemical incidents, which may be reportable to state agencies or in some cases remain undocumented. But the potential for accidents is staggering. In addition to the thousands of fixed sites and storage facilities that operate in the United States, more than 250,000 shipments of hazardous materials enter the transportation system each day.⁴⁸ Figure 1

gives an overview of chemical accidents in the United States over the last ten years. Of particular interest to environmental justice communities are the following incident types: “fixed” (release of material from non-mobile machinery, refineries, manufacturing plants, and other point sources), “continuous” (release above the Federal limits due to normal operations of a facility), “railroad” (including derailments of freight and commercial trains and other releases from rail), and “storage tank” (releases from containers that store hazardous materials).⁴⁹

Figure 1. Incidents Reported to the National Response Center Involving a Chemical Release, 1991-2002.



The importance of industrial accidents derives from more than the mere frequency with which such events are experienced in our nation’s industrial zones. Industrial accidents set the stage for many of the conflicts that occur in environmental justice communities. They offer rare glimpses into the standard operating procedures that allow facilities to function in close proximity to residential neighborhoods, conform to permit

and other regulatory requirements, promote a perception that the risks they present are within acceptable limits, and avoid state- or citizen-sponsored threats to the legitimacy of their operations. Much of the behavior that occurs in manufacturing and regulatory organizations has become so habitual (where workers and managers exhibit similar patterns of behavior when faced with a given stimulus without explicitly selecting it over other responses) that it is ungovernable by rational deliberation.⁵⁰ The questioning and changing of habitual routines can only occur under a relatively limited set of circumstances, many of which are set in motion during an industrial accident:

Encountering a novel state of affairs: When a situation is relatively unique, uncertainty over its meaning can lead to a reconsideration of available responses, although the degree to which the situation must be different from what workers are accustomed to can vary.⁵¹

Experiencing a failure: Sudden failure to achieve certain objectives (such as production runs or safe operating conditions), and the re-evaluation of goals that it can encourage, leads to uncertainty and the need to reconsider the appropriateness of routines. However, some groups that experience failure will simply execute their existing responses more vigorously. In addition, some organizational groups will close down rather than open up when under stress.⁵² Thus it is possible that certain levels of failure will lead to an “escalating commitment” to existing routines rather than a reconsideration of their appropriateness. Social facilitation theory also suggests that heightened arousal during times of crisis will encourage the enactment of dominant responses.⁵³

Reaching a milestone: Studies of group behavior suggest that motivating goals, breakpoints, and the discretion to make changes can lead to the review and reconfiguration of routines.⁵⁴ Various milestones (including anniversaries, deadlines, disruption of trends) can give organizations the stimulus to break free of old patterns and start new ones.

Receiving an intervention that calls attention to group norms: Interventions from both inside (management) and outside (regulators, industry groups) an organization can encourage review of habitual behavior. The intervener must be able to alter the focus of groups from carrying out their routines to examining their appropriateness.⁵⁵

Coping with changes to the structure of a group: Changes to the composition of groups, the design of their tasks, and the amount of authority they have to manage their work can lead to questioning of previously accepted routines.⁵⁶

Accidents present an opportunity for community members to focus attention on the routines at work within chemical facilities that lead to, magnify, and limit learning from accidents, and the habitual responses evidenced by state and federal agencies that fail to

adequately inform or protect residents or give them a role in environmental decision-making.

Irrational Outcomes of Community-Corporate Negotiation

For the negotiation theorist, accidents that occur in environmental justice communities provide a novel situation in which various dispute resolution techniques are being applied for the first time. The central puzzle that is presented when one considers these negotiations concerns the “doubly irrational” outcomes that they can generate.⁵⁷ Despite the strong tendency of settlements to fall through when it is perceived that one side benefits more than the other, and contrary to the fairness norms such as equity and equality that one would expect to factor heavily in the results of negotiations with environmental justice communities, agreements were reached in every case that I considered. In addition, parties to the negotiations evidenced many of the behaviors and strategies called for in the negotiation literature for the production of agreements that satisfy the underlying concerns of all parties. At the same time, the agreements were suboptimal from the standpoint of *all* parties: industry representatives operating in the aftermath of industrial accidents and under the shadow of the law and the regulatory state offered expensive concessions that were not linked to residents’ primary interests, while they rejected low-cost proposals from their host communities for improving residents’ most pressing concerns. Resident concerns focused on symptoms of poor emergency response planning, environmental monitoring, notification, and citizen involvement that were revealed during the accidental releases which galvanized each community. It is striking to learn how these organizing themes were dismissed, tabled, or bargained away

over the course of each negotiation. And it suggests that the existing literature on dispute resolution is unable to disentangle the complexities of community-corporate negotiation in a way that elucidates (a) interests, issues, and offers that may remain tacitly understood or off-limits after an industrial accident, (b) forces at work that can narrow the set of interests represented in such a negotiation, *despite* the use of elements of integrative bargaining known to contribute to the expression and expansion of interests addressed, and (c) the proper role of neutral interveners (mediators, facilitators) in bringing these to the fore and making parties understand what can or cannot be accomplished within a certain window of opportunity after an accident.

It is imperative that environmentally overburdened communities come to terms with these questions, because of the context in which they are asked: cases where the disenfranchised have successfully organized, secured technical and legal assistance, opened lines of communication with heretofore monolithic industrial complexes, and achieved substantial leverage over their operations. By viewing the limits to integrative bargaining in this context, we can isolate the areas of greatest resistance to change following accidents, and the potential for mutual gains that exists should these problems be translated into new agenda items for future negotiations. It may also be possible to link the current use of administrative and adjudicative processes to some of the narrowing of interests that occurs, and suggest how the “solution space,” or set of available proposals and agreement provisions for a negotiation, can be protected even during these traditional forms of conflict resolution.

Toward a Theory of Narrowing

Negotiation theory focuses on efforts to expand the set of options, resources, and actions available to parties who have a stake in the outcome of a dispute (see Chapter 2 for an overview). There are numerous ways in which this can be done, including techniques employed by a neutral mediator, various means of compensation and cost-cutting, and contractual strategies. Efforts to encourage what is known as “integrative bargaining” can begin long before parties sit across the table from one another, through attempts to ensure proper representation of interests, sufficient discretion to commit among the individuals selected, and an appropriate set of procedural norms to encourage the generation of new ideas under conditions of minimal pressure to commit to any given proposal. This body of knowledge, culled from economists, administrative theorists, and social and cognitive psychologists, is constantly being introduced to new arenas of conflict in the public sector, including labor-management and environmental disputes. I argue that in the context of environmental justice disputes, the theory has limited explanatory power. While it can offer rigorous treatments of what is possible during a given negotiation and prescriptive advice regarding how to engage in integrative problem-solving, it is silent when faced with barriers that lie beyond the procedural give-and-take of a small group and a mediator, or the individual or group decision-making biases that can pervade such a situation.

Given this limited repertoire for assessing or influencing conflict, it is not surprising that negotiated agreements that fail to meet the interests of certain parties are explained under the broad banners of “rational actor” behavior or “power imbalances.” The former perspective seeks to identify important features of a negotiator’s strategic

context that impose constraints on self-interested behavior.⁵⁸ For example, a rational choice scholar may point to a classic prisoner's dilemma, where changing rules of interaction will lead to different choices of behavior (i.e., to defect, cooperate). In the cases that follow, we will certainly see examples where industry or citizen representatives adjust their strategies to match certain constraints imposed on them during negotiations. The notion of power imbalances describes a situation where a party's interests cannot be met because its "backstop" or alternative to a negotiated agreement is weak, the party's dependence on an opponent limits his ability to defect, or one side holds a monopoly over certain forms of information, expertise, or other resources. Again, power imbalances undoubtedly occur between informal community-based organizations and multi-billion dollar corporations operating complex facilities. The subtext for either explanation is simple: stakeholders' preferences are assumed, and the manner (rational choice) and extent (power imbalances) to which they are pursued are subject to change and limitation. The negotiation theorist in turn can get to work adjusting procedures and addressing stakeholder asymmetries in order to induce a more balanced probability that each party's interests will be expressed and lodged in any settlement. We will see how either perspective is "too thin," leading to only a partial view of the potentials and pitfalls of negotiation in the context of industrial accidents. The rational actor model allows for too much agency among parties to a negotiation in terms of their ability to adjust their behavior to more optimally pursue their preferences, which are taken as exogenous. The notion of power imbalances grants too much agency to those who would intervene during a conflict, such as mediators, arbitrators, and ombudsmen. It suggests that impediments

to agency can be adjusted, or “brought into balance” through various forms of assistance by a neutral third party.

I will show how in a highly regulated, institutionalized context (such as the response of agencies and environmental managers to disruptions at a petrochemical plant), a “thicker” account of the structural limitations to meeting stakeholder interests is required. We must account for how the unique “collection of institutions, rules of behavior, norms, roles, physical arrangements, buildings, and archives that are relatively resilient to the idiosyncratic preferences and expectations of individuals”⁵⁹ in such situations can alter and restrict stakeholder *preferences and goals* as well as strategies that are the focus of rational choice scholars. By leaving problematic how negotiating groups define their self-interest, we can identify the forces that work to shape them and encourage agreements that deviate from objectives that led to stakeholders’ initial participation in dispute resolution processes. Throughout this dissertation, I will examine cases where the narrowing of interests, proposals, offers and counteroffers, and other actions occurs beyond the scope of existing negotiation theory. I will explore four dynamics that can act alone or in concert to sufficiently foreclose an affected population’s primary interests from rational deliberation or displace initial preferences.

The key factors that will be considered include:

1. The manner in which an accident unfolds, is reported, and is responded to prior to a negotiation;
2. Efforts, if any, taken by plant-level workers and managers to limit changes to the status quo, including existing role structures, standard operating procedures, production rates, and production processes;
3. The effects of parallel adjudicative or administrative actions taken on behalf of the affected community on resident objectives, agenda-setting, data collection, and the timing and scope of available agreements; and

4. Limits imposed by the nature of the facilities involved and the technologies employed for source reduction, pollution monitoring, and risk regulation, including ways in which these technologies alter resident goals and available paths for meeting them.

Through a close examination of three cases of industrial accidents which led to community-corporate negotiation, I will be able to outline a theory of how these forces work in various combinations, and how standard protocols and tactics introduced in the negotiation literature fail to account for their effects. The broader objective of this research is to show how such limits to the representation of affected communities' interests operate, whether they become more than the sum of their parts when they occur in tandem, and how they can shed light on the most stubborn elements of resistance to change in environmentally overburdened communities. By expanding our understanding of conflict resolution in this area of practice, we become increasingly aware of the next generation of struggles facing the environmental justice movement, now that it has reached a critical mass of community organizing, networking, and legal and technical expertise and often commands sufficient leverage to neutralize many of the power imbalances that historically shaped the landscape of overburdened communities.

Of the six cases that I considered (three of which are discussed in-depth in this dissertation), five yielded negotiated agreements that failed to address the primary interests expressed by residents affected by accidents (and in certain instances the responsible parties as well):

Swansea, CO – Conoco mediation: A series of non-permitted emissions prompts residents, a statewide public interest organization, and state and federal agencies to seek enforcement of various statutes at a Conoco petroleum refinery. Facility management agrees to negotiate a settlement to residents' citizen suit. Resident proposals rejected by Conoco include joint exploration of potential odor sources, on-site monitoring, the hiring of a community technical consultant to review options for equipment upgrades, a notification system to warn residents during heavy flaring, the pursuit of monitoring

technologies for advanced warning of residents during releases, and a review of sources of potential releases at the facility. Litigation settlement addresses sulfur dioxide emissions to the exclusion of other concerns, including benzene emissions to groundwater that were the cause of state and federal agency intervention. Compensation to the affected community is unrelated to residents' primary concerns, including security (residents demanded assurances of reduced flaring and toxic emissions as well as a notification system), sense of control (through joint coordination of data gathering and an understanding of risks associated with chemicals released by the refinery), and empowerment (the ability to educate residents about the risks posed by the facility).

Kennedy Heights, TX – Chevron mediation: The discovery of hydrocarbons under a subdivision in southeast Houston leads residents to try to establish links between abandoned crude oil storage pits and high levels of cancer and lupus in the area. During mediated settlement of mass tort litigation, numerous proposals are raised by residents, including the movement, replacement, and repair of water lines constructed through the oil pits, soil remediation in clearly defined areas, set-asides for potential cleanup should the EPA find new evidence of contamination at a later date, water filtration systems in homes defined as particularly at-risk by a fate and transport model, medical treatment for both acute and chronic conditions prevalent in the subdivision, and the buyout of homes over two of the three pits. Settlement includes the allocation of an average of \$4,000 to over 3,000 plaintiffs according to time lived in the subdivision, distance from pit centers, and a small personal injury award for high-profile diseases. The settlement does not address residents' primary interests of security (assurances of no further risks from contaminated soil or water due to pipe breakage, medical care and monitoring, clean-up of areas agreed to during site sampling to have significant quantities of hydrocarbons, efforts to fix, move, or otherwise mitigate waterlines) and economic well-being (sufficient funds to enable certain families to relocate, including transaction costs, efforts to address structural damage to the community's home foundations, yards, and sidewalks).

Manchester, TX – Rhone Poulenc permit renewal negotiation: A sulfur dioxide release increases resident scrutiny of a permit modification for a nearby incinerator. Unassisted negotiations include the facility's rejection of such proposals as joint monitoring of Rhone Poulenc-contracted truck traffic, increased monitoring of groundwater and air emissions, sharing of monitoring data, a citizen's health survey, efforts to canvass the neighborhood to determine symptoms of disease and their distribution throughout Manchester, residents' ability to notify the facility of certain conditions, citizen audits and influence over the facility's response to recommendations, and emissions reduction pledges. A settlement which leads to permit approval incorporates facility commitments already made or projected for the near future. Provisions include the sharing of data with a newly-formed community advisory committee (already required by state agencies), sharing of existing monitoring data and modeling on a one-time basis (already required by the Texas Natural Resources Conservation Committee), an independent environmental audit (already required by permit), and \$4,000 for a health survey that followed certain protocols accepted by Rhone Poulenc (never implemented). Residents' interests in security and sense of control over environmental conditions are not addressed (no pollution reduction offers or proposals for resident involvement in emergency notification are accepted).

North Richmond, CA – Chevron permit negotiation: During an environmental impact assessment process for construction at the Chevron Richmond Refinery, there is a

sulfuric acid release at a facility co-located on refinery grounds that is operated by General Chemical. The accident sends 24,000 to area hospitals and clinics. Various efforts by organized community groups and regional environmental organizations to negotiate project mitigations are made, before the City Planning Commission, City Council, and the Air Quality Management District. Face-to-face negotiations include Chevron's rejection of numerous proposals and issues of concern, such as community right-to-inspect, nitrogen oxide emissions reductions, Chevron control over General Chemical facility emergency management, water emissions (mercury and selenium), residents' heavy reliance on the Richmond Marina for subsistence fishing, mitigation funds for school and home improvement to address the inadequacy of shelter-in-place programs, and efforts to address 90% asthma rates in nearby elementary schools. A Memorandum of Understanding is signed, offering reaffirmations of existing efforts and large financial commitments to the broader community that are unrelated to their primary interests of security (a proposed fence-line monitoring project yields contradictory results and is never implemented, air and water emissions increases continue unabated, and certain constituencies such as fishermen and elementary school children are excluded from the MOU) and control over environmental conditions (the MOU includes no changes in the direction, quality, or means of post-agreement community-corporate relationships).

Rodeo/Crockett, CA – Unocal permit negotiation: An environmental assessment process is disrupted by a 16-day release of Catacarb, a refinery catalyst known to cause neurological damage, skin disease, birth defects, and other health problems. The County Board of Supervisors requests that Unocal participate in negotiations with a broad coalition of residents from several small, unincorporated towns and a public housing development before granting construction permits for the refinery's reformulated fuels project. Committees of residents develop innovative, cost-effective proposals, such as community-wide neighborhood environmental watch, replacement of flaring with ground-style facilities, on-site professional monitors of the communities' choice on a 24-hour basis, community odor and spill patrol teams, surveillance cameras at major refinery units, flares, and fence-lines, citizen monitors inside the property to participate in the activation of public notification and warning systems, fence-line monitors wired to fire departments and residences to ensure early detection and control of release sources, computerized databases with information on the effects of known hazardous materials and recommended treatments, and soil lead testing in the Bayo Vista housing development along with Catacarb sampling. All such proposals are rejected early in the negotiation process. Settlement includes a 15 million dollar commitment, with less than 1% devoted to residents' primary interests: security (there is no noticeable improvement to notification, response, agency procedures, or community involvement to reduce the frequency and effects of refinery accidents) and sense of control (low-cost proposals for citizen monitoring or involvement are rejected). Millions of dollars are spent on remote sensing technologies that have yet to be used in improving emergency response during an accident.

The conventional wisdom regarding steps that should be taken to engage in "effective negotiation" is described in greater detail in the next chapter. Then, three cases will be considered in-depth. First, the response to crude oil contamination of drinking water

through pre-litigation site and risk assessment and its effects on a mediated settlement will be discussed in Chapter 3. Next, the historical development of the “Unocal Good Neighbor Agreement” is presented in detail in Chapter 4, allowing us to consider further structural limitations to integrative bargaining. Chapter 5 presents the Conoco mediation as a function of parallel administrative actions. The lessons that emerge from these case studies will be applied to the other examples of industrial accidents leading to community-corporate negotiation in Chapter 6. A theory of narrowing will be sketched and used to suggest a balancing of agency and structure in negotiation theory that will lead to greater explanatory power and more useful prescriptive advice to agency, industry, and community representatives.

Chapter 2

Effective Negotiation: The Conventional Wisdom

Introduction

A rapid increase in the use of formal negotiation techniques in environmentally overburdened communities⁶⁰ follows the development and intersection of the environmental justice movement and the field of environmental dispute resolution.⁶¹ A recent drive to institutionalize dispute resolution practice in areas of policy that are prone to claims of environmental inequity is rooted in the promise of “integrative bargaining,” or efforts to allow each party in a dispute to move to a more favorable position on their relevant utility curve. The ideal outcome of integrative bargaining is commonly known as an “efficient” or “Pareto optimal” agreement. Because efficient solutions to conflicts are often not known or obvious to parties, the field of environmental dispute resolution has sought to better understand the conditions necessary for encouraging exploration of the efficient frontier. Negotiation theory suggests that the extent to which these conditions are met in a given dispute will determine how close the outcome reached is to the frontier. The notion of Pareto efficiency has led to troubling assertions regarding the logic of facility siting and waste disposal in low-income communities of color. Yet integrative bargaining remains at the core of our theoretical understanding of how negotiation can meet the interests of disadvantaged groups. Here I consider the meaning of integrative bargaining from the standpoint of an environmentally overburdened community, and introduce the tactical/procedural, social-psychological, and group decision-making variables that have been described in the literature as necessary for achieving integrative potential. From this literature I will distill the most important

elements of integrative bargaining, and offer a criticism of the theory's silence with regards to the manner in which institutions (i.e., agencies, rules, routines, technologies) can structure political situations and leave their imprint on outcomes, including negotiated agreements. I call for a greater balance between elements in negotiation theory that speak to exploration of the efficiency frontier and those that constrain the set of expressed interests, goals, and strategies.

The Theoretical Emergence of Integrative Bargaining

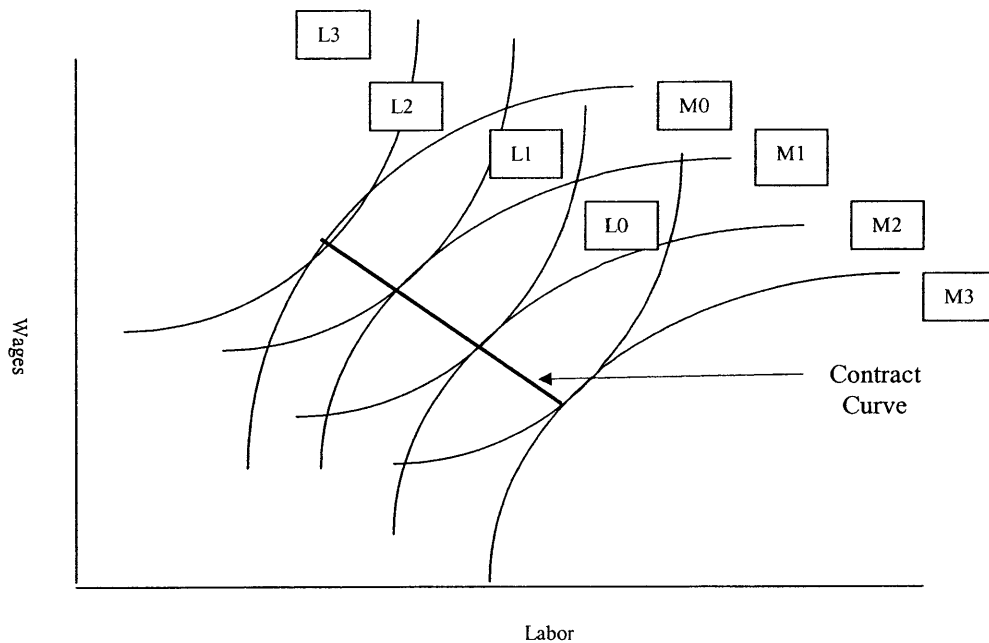
Much of the appeal of negotiation and collaborative approaches to resolving environmental disputes lies in the logic of "integrative bargaining." This term represents a distinction that has long been drawn in public administration between compromise and integration in joint decision-making.⁶² Compromise occurs when a dispute centers on issues that involve a fixed total objective value which can be allocated between the parties in various shares or proportions. Integration occurs when the focus of a dispute is on problems, where agenda items contain possibilities for greater or lesser amounts of value which can be made available to the parties. In theory, the potential for an integrative negotiation increases as the number of parties and issues for discussion increase, and the manner in which areas subject to negotiation are valued becomes more diverse. Under these circumstances, parties can search for ways of structuring a deal that will benefit each party more than the simple division of one or more assets. Even if parties all want the same things, it is still possible to reach an integrative solution, as long as each side places different values on each.

Much of the history of negotiation theory was rooted in “distributive bargaining,” which was first considered in Von Neumann and Morgenstern’s *Theory of Games and Economic Behavior* (1944). This work characterized the optimal solution to zero-sum games (involving two players where one wins if and only if the other loses).⁶³ The authors also introduced a version of game theory⁶⁴ to address cooperative situations. The latter, which has spurred the development of a variety of *n*-person interactions and has even encouraged “fair share” treatments of coalition-building within multilateral disputes, has not received significant attention and is almost absent from modern texts of game theory.⁶⁵ The reason lies in the complexity of situations in which cooperation can occur, namely multiparty disputes. Even three-person, zero-sum games have a large number of solutions, and it has proven difficult to characterize the solutions to every game.⁶⁶ In their place, simple concepts applied to two-person situations, such as the prisoner’s dilemma,⁶⁷ have proliferated and informed negotiation theory and policy design as well.⁶⁸

Bargaining theory was significantly advanced through its formalization by Nash, who proved that an equilibrium position will always exist when there are a finite number of agents and a finite number of strategies in a dispute.⁶⁹ In a game with two bargainers, for instance, A and B parties seek to split a value *v*. This can only be achieved if they agree on a division. If no agreement is reached, A will get *a* and B will get *b*. These are called backstop payoffs, which have become known as BATNAs (Best Alternative to a Negotiated Agreement) in the negotiation literature.⁷⁰ The Nash cooperative solution applies a rule which states that each player is to be given their backstop plus a share of the surplus obtained from reaching agreement. These “Nash formulas” for each party can be represented in slope-intercept form where an intersection of the two lines is the Nash

solution. This theory led to the integrative approach to negotiations, which states that no available mutual gain should go unexploited.⁷¹ The analytic convenience of the Nash bargaining solution,⁷² clear limits to the predictive capabilities of cooperative theory, and doubts about the solvability of some n -person games⁷³ encouraged the dominance of negotiation prescriptions rooted in Pareto efficiency. Pareto efficiency is a notion similar to Edgeworth's (1881) "economic calculus" for drawing up a contract between two parties exchanging commodities.⁷⁴ Edgeworth showed that when the indifference curves of two individuals are superimposed, each curve for party A is tangent to a unique indifference curve for party B. This is due to the qualities of parties' indifference curves, which are subject to the law of decreasing utility and the law of increasing labor. The curve consisting of these points of tangency is called the contract curve. A point not on the contract curve corresponds to a contract that could be improved for one party without worsening it for the other. The pursuit of contracts that correspond to a point on the contract curve mirrors the pursuit of Pareto efficiency, the notion of which is nearly ubiquitous in negotiation texts in use today.

Figure 2. Edgeworth's Contract Curve for a Labor-Management Dispute.

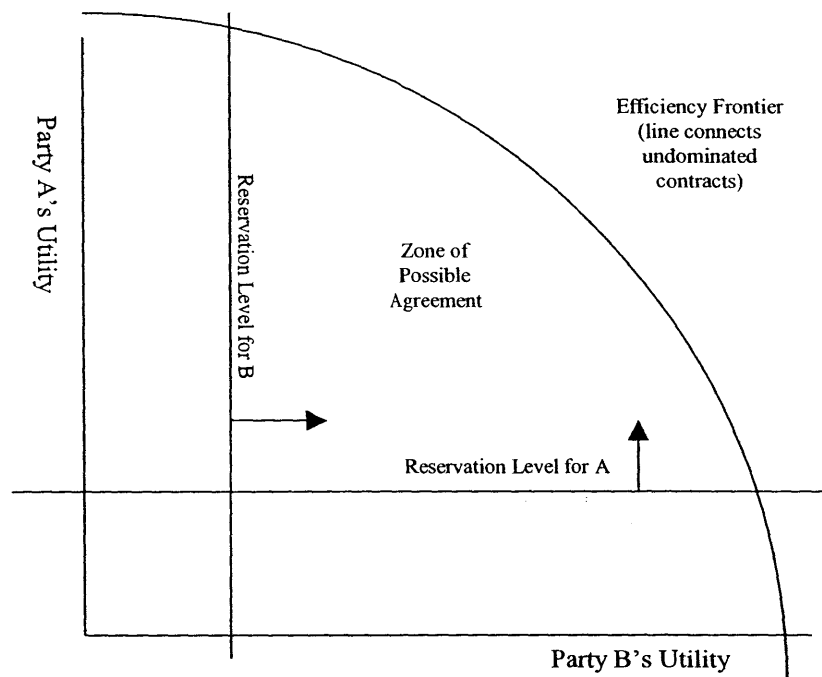


Indifference curves L0-L3 correspond to the employee's utility, subject to the law of increasing labor (L0 represents initial position). Indifference curves M0-M3 correspond to the manager's utility, subject to the law of decreasing utility (M0 represents initial position).

The pursuit of a formal logical structure of conflicts, begun by Edgeworth, is directed at the conditions that will ensure their optimal resolution.⁷⁵ A second line of scholarship has arisen to tackle the sequential programming of interactions of parties involved in a conflict. This field, known as negotiation analysis, is also deeply rooted in notions of Pareto efficiency.⁷⁶ Here, the contract curve is called an “efficiency frontier,”⁷⁷ and integrative bargaining is evoked as a means of reaching agreements that approach this limit. A number of analytical tools have been developed that can be used to plot potential contracts between parties, according to how they are ranked, either on a cardinal or ordinal scale. From a plot of all contracts can be inferred a set of efficient contracts, or those that jointly dominate the rankings of other contracts. These embody the “efficient frontier” in a bargaining situation, which when coupled with parties’

reservation values (the lowest utility that either side would accept from an agreement) define a “zone of possible agreement.” It is argued that the purpose of integrative bargaining is to explore means of reaching an agreement that is as close to the efficient frontier as possible.

Figure 3. Integrative Bargaining Defined as Reaching an Efficiency Frontier.



From the standpoint of a neighborhood faced with the siting of an undesirable land use, the notion of Pareto efficiency can appear disturbing. After all, the efficiency frontier does not discriminate between contracts near the edge of one of the parties' reservation levels and those toward the middle of the frontier. The utilitarian argument for ensuring “good policy” when the former occurs is to propose a hypothetical compensation test for the agreement: If “winners” gain enough to compensate losers fully and if they still come

out ahead, then the agreement is considered a “policy improvement.”⁷⁸ Clearly, this test ignores the differences in the value of money to people of different socioeconomic backgrounds, or whether issues of concern to low-income minority communities can be quantified and converted to a monetary metric in the first place.⁷⁹ Some environmental justice advocates would further argue that negotiated settlements, even when they include full compensation to a community, are still inherently unfair, as the cost of compensation would still be lower than what a wealthier neighborhood would demand. And there is no denying that the logic of Pareto efficiency, when used to address environmental burdens, has appeared offensive when leaked to the general public, exemplified by Lawrence Summers’ World Bank memo (“The economic logic of dumping a load of toxic waste in the lowest wage country is impeccable and we should face up to that”).⁸⁰

Nevertheless, integrative bargaining, and efforts to encourage it, cannot be dismissed out of hand. Compared with available legal remedies and legislative initiatives, integrative bargaining, when carried out through a variety of alternative dispute resolution⁸¹ practices, promises greater flexibility, scope of salient issues, control over outcomes, and potential to meet unique interests. Rather than objecting to the use of negotiation in such a context, it is important to investigate whether the inherent logic of integrative bargaining holds true in overburdened communities. If there are real limits to its use, then the lawyers, organizers, and residents involved in determining a course of action in a given community should understand them before a bargaining situation is entered into. If certain conditions known in the negotiation literature for encouraging integrative bargaining are not present, this, too, should be shared with professional

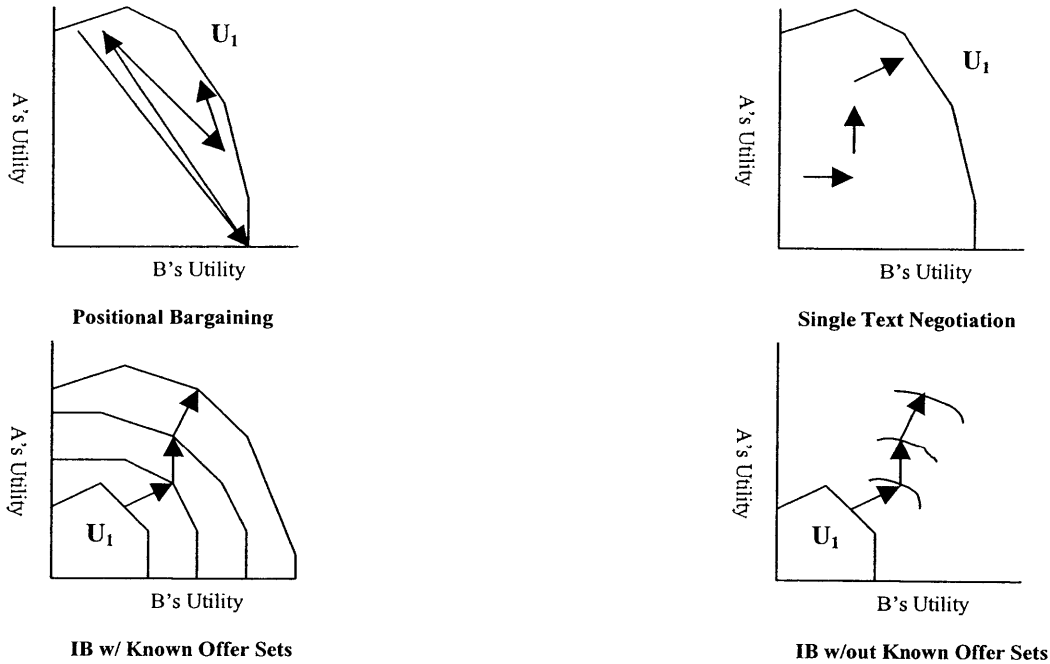
mediators, facilitators, special masters, and stakeholder representatives so that sufficient resources and attention can be redirected.

In addition, Kersten's (2001) characterization of negotiations allows us to consider integrative bargaining as more than a simple movement toward an efficient frontier (or the search for dominating offers within a given set) with the possible necessity of side payments or compensation should a result prove efficient yet inequitable.⁸² Indeed, a negotiation that produces a strictly "efficient" offer suggests that other offers, should they produce further gains for one party, will produce losses for the other. To avoid this paradoxically distributive end result of integrative bargaining as reaching Pareto efficiency, we must think of IB as a process which creates the potential for value creation through the *changing of the initial offer space*. This can be done through the following activities:

1. Modifications of one or more constraints defining the initial set of feasible offers
2. Addition of new offers which expand the set
3. Changes in the dimensionality of the set (i.e., a new attribute is discovered that is indicative of parties' joint interests)

These truly integrative activities introduce a qualitative difference to the negotiation process, as opposed to simple quantitative differences that are the focus of much of the literature that views IB as efforts to reach an efficient frontier. Figure 4 illustrates the differences between two forms of distributive and two forms of integrative bargaining.

Figure 4. Examples of Negotiated Improvements in Distributive and Integrative Bargaining.



Arrows in each drawing represent a sequence of alternating offers. In the positional bargaining example, parties make initial offers that yield comparably high utility values for them. Each subsequent offer corresponds to a small concession. Under certain conditions, a compromise is reached that may or may not be near the efficient frontier. One technique of reaching as close to the frontier as possible under these circumstances is for one party to propose several offers that yield the same utility for them, and the other party selects one of them. The single text negotiation in the upper right was developed by Fisher and Ury.⁸³ Here, an initial offer is made that yields low utility for both sides. Parties either work together or with a mediator to point out the flaws in the design and create changes to the offer. The process continues until either an efficient offer that

cannot be further improved is made, or until external pressures, decision-making biases, or information processing challenges bring the talks to a premature close. The requirement for each stepwise movement toward the frontier is that each subsequent offer must dominate the previous one, an essentially distributive exercise. Truly integrative bargaining is depicted in the lower left and right corners of Figure 3. The utility curve to the lower left of these drawings is equal to the curve (U_1) in each distributive bargaining example. In the lower left, parties know the available sets of offers. In the lower right, parties expand the offer set without defining the expanded sets. The key difference between the IB and DB examples is that in DB, parties do not modify the set of offers and merely strive for efficient solutions within an existing set, whereas IB involves the creation of value or new alternatives through restructuring of the problems at hand. If we view integrative bargaining in such a way, then its underlying logic can be turned from the efficiency of clusters of noxious facilities to the adequacy of existing efforts to improve the lives of those who dwell in such places.

Meeting Integrative Potential: The Received Wisdom

Integrative bargaining sets a high standard for itself by evoking its ability to produce agreements that are more stable than compromises (which encourage issues to resurface at a later time), its tendency to strengthen the relationship between parties by encouraging problem-solving, and its potential to contribute to the welfare of a broader community in which multiple parties are members.⁸⁴ The literature suggests that parties should focus on several factors which are supposed to lead to conditions conducive to IB and an increase in the joint benefit available to industry, agency, and community

representatives. Pruitt (1981, 1983) was one of the first to espouse strategies by which parties' initially opposing demands in a negotiation could be transformed into alternatives to reconcile their interests and yield integrative solutions.⁸⁵ These include:

1. Increasing available resources: This is a useful approach when parties reject certain demands because of opportunity costs. If a rejected proposal reflects its inherent costs to another party, then increasing available resources may not encourage agreement. Parties are encouraged to consider whether the conflict hinges on resource shortages, and whether critical resources can be expanded through joint action. This tactic has come to be known as "increasing the pie" or "avoiding the fixed-sum error."⁸⁶
2. Nonspecific compensation: Through the gathering of information regarding what each party values and what they are sacrificing through the concessions that they make, adequate compensation for these concessions can be determined.
3. Logrolling: Sometimes, negotiation agendas can be developed that consider several issues where parties have different priorities among them.⁸⁷ Here, all parties, rather than one or a small subset (as in #2), are compensated for making concessions desired by others. It is necessary to understand each party's priority orderings in order to move systematically through a series of possible packages⁸⁸ or single-text agreements (tentative negotiation proposals that are examined, criticized, and improved by all parties).
4. Cost-cutting: Integrative bargaining can occur when one or more parties achieve their objectives while others' costs are reduced or eliminated. This tactic focuses on the costs incurred by certain stakeholders because of their acceptance of a proposal, rather than on providing an unrelated repayment.
5. Bridging: Similar to logrolling, parties work to satisfy the most important interests underlying their demands. This tactic is derived from Simon's (1957) notion of a search model of administrative decision-making.⁸⁹ If initial efforts do not yield a mutually acceptable proposal, then each party will discard some of their lower-priority interests and recommence the search for a new option. The tactic of looking past superficial demands was popularized by Fisher and Ury.⁹⁰

Other tactics for achieving IB have emerged, focused on the contractual problems associated with bargaining. These include solving problems of adverse selection and moral hazard,⁹¹ and the construction of post-settlement settlements (which allow further

movement toward the efficient frontier).⁹² Taken together, these are the basic tactics that embody the kind of creative problem solving that can lead to integrative agreements. They can be used in isolation or together to either expand the zone of possible agreement, move toward the efficient frontier, or remedy some of the inequitable consequences of an agreement. They overlap somewhat with Lax and Sebenius' (1986) catalogue of opportunities (stemming in large part from parties' attitudes and perceptions) for integrative bargaining, which focuses on exploiting differences between parties in terms of their (1) interests and how they are valued, (2) view of possible future events, (3) level of risk-aversion, (4) time preferences, (5) attitudes toward precedent and principle, (6) constituencies, (7) criteria for success, and (8) capabilities.⁹³ Lax and Sebenius were the first to give form and precision to these means of using common differences to create value.

Wetlaufer (1996), by outlining the contexts in which these opportunities can lead to integrative bargaining, showed how the general conditions underlying a dispute must be coupled with certain of Pruitt's tactics for value creation in order to yield truly integrative solutions.⁹⁴ For example, increasing available resources ("expanding the pie") through a focus on parties' differing probabilistic assessments of the likelihood of a future event (number 4 above) can only happen if parties (a) are willing to speculate and bet on their projections, (b) avoid risk-bearing combinations that decrease the probability of agreement, (c) construct appropriate contingent agreements that account for their differing time preferences, and (d) take action within a small window of opportunity before the increased resources become unstable or return to their original position. Of course, each of these activities requires that parties engage in joint problem solving

characterized by a certain level of cooperation, information-sharing, trust, and honesty.⁹⁵ Pressures to engage in distributive bargaining or value claiming behavior inherent in all IB situations will limit these behaviors. Wetlaufer suggested that opportunities other than those provided in Lax and Sebenius' conditions number (1), (2), and (4) above will not result in integrative bargaining unless they are combined with one or more of the other conditions and tactics.

As integrative bargaining was increasingly applied to labor-management disputes (under the rubric of "mutual gains" negotiation)⁹⁶ and then environmental conflicts,⁹⁷ several developments have sought to provide additional nuance to our understanding of how integrative bargaining works. First, renewed focus on cognitive aspects of negotiation gave scholars an opportunity to criticize traditional behavioral⁹⁸ and game theoretic⁹⁹ approaches to bargaining, which as we have seen focused on parties' expected utility. Psychological research showed that parties will often violate the rules of utility theory upon which integrative bargaining theory was first constructed.¹⁰⁰ The dominant bias in environmental disputes was found to be the assumption that a negotiator's interests will directly oppose other parties' interests (the "mythical fixed pie problem").¹⁰¹ A primary example of this bias in action occurs during CERCLA litigation, when parties attempt to shift cleanup liability rather than agree to a prelitigation settlement that cuts down on transaction costs. Those who carry the fixed-pie assumption through a negotiation will also exhibit information processing errors, either misunderstanding or ignoring certain data as it becomes available or reactively devaluing concessions made by their adversaries.¹⁰² It also limits parties' chances of achieving log-rolling gains or finding outcome preferences over which parties agree. Other cognitive

biases that can limit the integrative potential of a negotiation include sacredness (viewing certain issues as unavailable for trade or compromise),¹⁰³ the endowment effect (prior ownership of a good or experience of a positive state will increase its perceived value and make it more difficult to trade)¹⁰⁴ overconfidence (individuals overestimate the probability of their accuracy),¹⁰⁵ positive illusions (belief that one does more harm or good than reality suggests and attribution of desirable behaviors to in-group members),¹⁰⁶ egocentrism (justification of one's assessment of fairness by changing the importance of attributes affecting what is fair,¹⁰⁷ and framing (consistent with prospect theory, negotiations will have different outcomes when they are described as bargaining over losses or gains).¹⁰⁸ These biases can have a substantial impact on stakeholder perceptions and behaviors, and therefore their ability to reach the integrative potential of a negotiation.¹⁰⁹

A second area of development concerns group behavior and decision-making barriers to integrative bargaining. Three primary areas of research concern group dynamics, coalition-building, and representation. Group relations studies¹¹⁰ suggest a variety of social influence effects on rational efforts to reach agreement, behavioral norms and roles, and preferences. Social influence theory began with studies of task performance in the presence of others and grew into several research programs aimed at teasing out more systemic effects of group membership on conformity to norms and positions. The importance of social influence lies in its effects on the acceptability of solutions or agreements, through the establishment of “groupthink,” “valence,” and “risky shifts.”¹¹¹ Through such mechanisms, groups can problematize individuals' preferences or even lead to reversals. Even absent social influence, group negotiations

require that proposals are kept incomplete, meaning the plethora of possible endpoints available to a group blurs the interpretation of a party's expressed demands. Individuals must spend significantly more time either advocating norms of conduct or looking to the group for clues as to how to proceed (i.e., how should a "fair" agreement be identified? As equitable, equal, maxi-min, etc.?). Information processing demands increase, as do the complexities of interpersonal processes. At the same time, feedback to group members declines as the number of people involved increases, and patterns of interaction become unbalanced.¹¹² Members of groups prone to social influence and information processing problems have to address a series of issues before anything approaching a search for integrative solutions and their distribution can begin: they must agree to social combination rules (do we operate by consensus, majority rule, super-majority, deliberation, force?), distribute and adopt new roles and norms of behavior, and ensure that the negotiation holds open chances for group members to share new ideas and alternatives by keeping moves toward false consensus in check.

The increased complexities associated with group interaction create incentives to form coalitions and unique opportunities to cooperate. Coalitions lie between informal expectations of where cooperative energies should be directed and formal, codified rights and duties of parties to a collective. They tend to be short-term and are used to either ensure enactment of a set of decisions or the blockage of consensus. As with social influence mechanisms, it is an agent's *perception* of whose participation in a decision-making process requires her own and vice versa that determine the stability of coalitions.¹¹³ Raiffa's experience with coalition games suggests that prescriptive advice for parties seeking to join them is difficult to obtain.¹¹⁴ A better understanding of the

calculus of entry into coalitions and the tendency for different configurations to alter group decision-making should be required of parties and intervenors. For example, coalitions may encourage more efficient issue management, through the creation of unique, coalition-specific languages or frames of interpretation. Or, coalitions can be used to delay or disrupt consensus. Mediators who understand the degree to which coalitions within a group are nested, disjoint, or overlapping will be better able to spot where agents who can bridge or block group activities are located. There must also be an awareness of how a shifting network of coalitions can lead to role differentiation or confusion about how active each party should be in carrying out different tasks.

While self-interest and competitive strategies are responsible for the initial formation of coalitions, responses to the complexity of group interaction can also proceed in the spirit of cooperation. The support of multiple parties for emerging norms and incremental actions and promises can in and of itself encourage cooperation. Axelrod (1997) identified norms (or expectations for behavior) as the primary factor explaining cooperative behavior.¹¹⁵ Norms can substitute for costly monitoring schemes which Olsen (1965) argued will override the benefits to cooperation.¹¹⁶ Thus, it is important to isolate the mechanisms responsible for the emergence of norms in multilateral contexts. For example, mediators who are aware of parties' perceptions of similar negotiation settings will be able to anticipate how they will fall back on behaviors that were perceived as optimal in those other contexts. Helping parties define a negotiation setting in similar ways will facilitate interaction and the use of similar scripts, encouraging the cooperation necessary for joint problem solving and integrative bargaining.

The presence of non-monolithic parties, or stakeholders composed of multiple entities, results in a final challenge for groups seeking to engage in integrative bargaining. Each member of a group serves as an agent for x principals, who may or may not be agents for other parties. This added element results in the spreading out of negotiations from simply taking place “across the table” to occurring simultaneously within each non-monolithic party. One solution to this additional layer of complexity might be to tailor principle-agent models to real-world negotiation settings and use them to suggest the proper incentives necessary to ensure that a principal’s interests are represented. However, principals may not hold a monopoly on legitimate interests. It is quite probable that through the development of simultaneous principal-agent and across-the-table negotiations, agents will develop legitimate concerns that differ markedly from those of their principals.¹¹⁷ Parties and neutrals are left with the task of synchronizing these parallel negotiations and avoiding the adoption of norms or decision heuristics for group decision-making that will limit the effectiveness of principal-agent negotiations.

Limits to Negotiation Theory

Many of the conditions described as necessary for achieving integrative potential are evident in conflicts involving environmentally overburdened communities: parties have different interests (e.g., security, certainty, recognition, economic gain), as well as interests that they value differently. As an example of the latter, residents want steps taken that will increase their security from accidental releases while facility managers desire security in the form of continuous production. Residents want stability in the form of steadily reduced emissions, fewer episodes, and more predictable facility operations.

Managers of industrial facilities value stable relations with agency monitors and rule enforcers and a stable internal culture and division of responsibilities across various employee roles. They may have different conceptions of time, influenced by the urgency of needed environmental improvements, deadlines, or levels of risk aversion. Residents may give greater weight to costs imposed on future generations than their private counterparts. Each side may assign different odds to anticipated outcomes of a negotiation. For example, if a facility believes that certain raw material costs will increase while a community group anticipates lower costs, they might both agree to tie financial contributions to the plant's future profit margins, with each side able to live with the anticipated outcome. In addition, parties may have access to different kinds of information, skills, or capabilities that can be combined to form the basis of an agreement. The possibilities for reaching an integrative settlement among multiple parties are fairly unbounded in theory.

While strong gains have been made in explicating the tactical prerequisites, social-psychological inhibitors, and group decision-making challenges to integrative bargaining, focus on external, structural constraints on IB have been less productively verified and translated into useful prescriptions. Game theory has provided some useful models of creative problem-solving, including the combined effects of external constraints (such as deadlines, the cost of inspection of clause offers, and the fact that individual costs and benefits of negotiating are not synchronized) with internal, party-specific constraints (such as the potential value associated with a finite number of issues, the sincerity of proposals, the propensity to reject proposals, and the inefficient limits placed on searches for creative solutions when side payments are not allowed).¹¹⁸ To

date, however, little has been done to empirically evaluate models which vary structural variables or to compare the broader integrative and distributive models that have risen to prominence in the field.¹¹⁹ This is the case even though structural limitations, such as predetermined roles of parties that are defined by legal and political structures, have been given as a primary reason behind IB's limited initial acceptance by labor and management.¹²⁰ Incomplete understanding of how structural variables constrain IB or the available set of feasible offers for a given negotiation leads to prescriptive advice centered on procedural tactics and efforts to ensure productive group behavior and decision-making. While such endeavors are certainly useful, they can also lead to a false sense of security if they fail to explain to parties the possible limits to IB hidden within the structure of relationships between stakeholders and the broader economic, political, and technological context within which a dispute unfolds. Proponents of effective negotiation might therefore encourage representatives of environmental justice communities to engage in a certain level of cooperation, trust, and information exchange necessary to achieve integrative bargaining without a full disclosure of its inherent limits within this unique setting.

The attempt by victims of industrial accidents to negotiate with owners and regulators of petrochemical facilities gives us a setting within which to better synchronize agency and structure within negotiation theory. I will do this by demonstrating the tendency of such negotiations to narrow the preferences, goals, and strategies of relevant parties and the means through which these are discussed, translated into proposals, agreed to, and implemented. This approach bypasses the primary shortcoming of rational choice theory, which brackets the issue of preference formation or assumes an *a priori* definition

of self-interest. The influence of rational choice theory over the conventional wisdom of “effective” negotiation can be seen in how this assumption of preferences leads to admonishments to “identify stakeholders,” “categorize and order group interests,” and “ensure that primary interests are represented, expressed, and traded” through a dispute resolution process, as if such elements are clearly defined and waiting to be applied in a way that maximizes joint utility. Because preferences are fixed in this approach, suboptimal agreements are blamed on procedural mistakes, most common of which include incomplete representation, expression of existing interests in a group setting, tradeoffs, compensatory measures, and allowances for individual and group limits to these activities. My analysis proceeds from the assumption that people don’t simply ask “how can I maximize my self interest?” when faced with a given choice set; instead, they will follow situationally defined rules to guide their behavior, even when so doing may not meet their primary interests or concerns. We will see how in the case of an environmental justice community, leaving problematical how parties define their self-interest opens up the analysis to new factors that can constrain the full expression of interests, and the movement of a dispute resolution process from an industrial accident to the broader symptoms of disproportionate environmental burdens and neglect that persist in such a place.

We will proceed by taking an in-depth look at three cases. Rather than focus on the rational actor (agency) variables that are known to encourage movement toward an efficient agreement, I will treat each stage of the case (accident, response, negotiation, agreement implementation) as an occasion for changes to the initial offer space, through either (a) preference formation or change or (b) structural limits to their expression. It

makes little sense to focus on reaching an “efficient” solution in such a context, particularly when studies have shown that multiparty negotiating games such as those that occur following an industrial accident have more than one efficient solution and a nearly inexhaustible set of inefficient or unfair outcomes.¹²¹ It is the rethinking, displacement, and constraint of interests relating to the pursuit of relief from environmental burdens that parties and neutrals alike must be able to identify and guard against, lest we allow a dispute resolution process to devolve into a temporary exercise in conflict avoidance. A complete typology of the forces that can “narrow” the full expression of an overburdened community’s interests will include the institutions, roles, and responsibilities present during each stage of conflict formation and resolution that can shape actors’ preferences, goals, and strategies, mediate their relations of conflict and cooperation, and structure situations in ways that leave their imprint on outcomes. These factors will then be compared across six examples of post-accident negotiation in order to add nuance to how they can be expressed. At this point I will be able to provide a refined theory of narrowing that offers a more balanced approach to negotiation theory: through a clearer understanding of how qualitative changes to an initial offer space can be influenced by elements of agency (which predominate existing theory) and structure, we can seek to improve not only how overburdened communities approach the limits to integrative bargaining but also how negotiation analysts in general should consider conflict assessment, group facilitation, and process mediation.

Chapter 3

The Narrowing Effects of Pre-Litigation Site Assessment: Kennedy Heights Mass Torts Claims

Introduction

As compared with the good neighbor negotiations discussed in the next chapter, a two-year mediation process regarding toxic exposure in Houston, Texas was entirely shaped *prior to* the first meeting between residents and a court-appointed special master. Residents' interests remained off-limits throughout the process to such a degree that there is little sense today that their primary concerns, reflected in low-cost proposals and organizing themes prior to the mediation, were even considered. The narrowing effects on what resident interests were represented during mediation were generated by the manner in which the slow-moving, gradual contamination of a subdivision was responded to prior to negotiation. Through the use of site characterization and risk assessment, the scope of the accident was defined by a government agency (the Railroad Commission) and a private entity (Chevron Corporation, who owned the site prior to residential development) in such a way that did not reflect resident experiences with and stories of contamination, or their ideas for how to ensure an environmentally safe place in which to live.

The residents of Kennedy Heights in southwest Houston, Texas wrestle with a complex set of questions about their neighborhood. At base is their concern that something dangerous, potentially even poisonous, exists beneath the soil under their single family homes. To get answers, residents called upon the appropriate state and federal regulatory agencies in the early 1990's, specifically the Railroad Commission of Texas and the Environmental Protection Agency, to investigate what earlier contractors

hired by the city suspected was residual contamination from crude oil storage. The resulting investigations took ten years, and encompassed two of four elements of the scientifically accepted practice of risk assessment: exposure assessment¹²² and risk characterization.¹²³ Residents of the subdivision also sought redress in the courts, by filing toxic tort claims against the former owners of the site.¹²⁴ The two processes, risk assessment by the state and EPA and toxic tort litigation, are driven to varying degrees by questions of causation, which are answered by the same group of people: experts. Before residents can be told whether the air they breathe or the water they drink is causing them harm or threatening them, a series of “experts,” mostly contractors hired by an agency or potentially liable party, will first look at the totality of the evidence and make a series of judgment calls.¹²⁵

The final product, a risk assessment conducted by contractors for Chevron and accepted by the Railroad Commission and later the EPA, reflected merely a stylized account of a negotiated process between a regulated entity and agencies that lacked the wherewithal to participate in the give-and-take that was involved. While the conclusions were clearly stated, the assumptions underlying the findings and the process which led to the collection of data points were obscured or left out. The narrowing effects of pre-litigation site and risk assessment on resident interests that occurred in Kennedy Heights is important to demonstrate because, despite its shortcomings, the “weight of the evidence”¹²⁶ approach to risk assessment is accepted practice among regulatory agencies. More generally, it comports with the received view of science first sketched by Karl Popper. Popper noted that, far from universal knowledge derived from formal logic, science is an imperfect process involving intuition, conjecture, inference, professional

judgment, and repeated testing.¹²⁷ This sort of “deductive falsification” guides most of the progress of science today. However, a relatively recent development in the courts offers a competing view of science, one that is more closely aligned with the logician’s search for universal knowledge derived from formal logic.¹²⁸ The ascendancy of this new standard of scientific validity in the courts presents residents of contaminated communities with a conundrum: the methods upon which they must rely to demonstrate that their properties pose a risk and should be cleaned up call for improvement and greater transparency, while at the same time a new judicial interpretation of scientific evidence threatens to limit the interests of effected populations that are addressed and even render some of them off-limits after an industrial accident.

Following the Supreme Court’s decision in *Daubert v. Merrill Dow Pharmaceuticals, Inc.*,¹²⁹ federal trial judges are charged with the task of determining the admissibility of scientific evidence, including the results of site and risk assessments used in toxic tort cases. Because causation claims in toxic torts rest on expert testimony, this “gatekeeper” role for district judges is critical: if experts are not allowed to speak to their findings, the vast bulk of toxic tort cases will be dismissed on summary judgment. How are district judges supposed to evaluate evidence that purports to be scientific? *Daubert* requires a trial court, under Rule 104(a) of the Federal Rules of Evidence (FRE),¹³⁰ to determine whether an expert is testifying from scientific knowledge¹³¹ and whether their reasoning or the methodology underlying their findings is scientifically valid.¹³² In *dicta*, the Court added several criteria for whether information testified to by an expert witness could be considered valid, in addition to the test of “general acceptance” formerly used in *Frye v. United States*¹³³: whether the methodology employed to generate the information

can be proven wrong, whether the method has undergone publication or peer review, the existence and maintenance of standards controlling the technique's operation, and the method's known or potential rate of error.¹³⁴ Many courts have read these and requirements suggested in subsequent decisions¹³⁵ to mean that the evidence presented by a scientific expert should be without flaws, logical leaps, or inferences that have not been proven fully. Such a high standard of validity is evidenced in the "corpuscular approach" used by most courts: a proponent of scientific evidence must establish the reliability and relevance of *every individual study* from which they drew their findings (in addition to the same test for the expert's broader conclusions).¹³⁶ Absent this finding, summary judgment will be granted.

An example of the use of the corpuscular approach is *General Electric Co. v. Joiner*, the reasoning of which (along with *Daubert*) has been enshrined in a recent amendment of Rule 702 of the FRE.¹³⁷ In *Joiner*, the plaintiffs' experts concluded – and offered to testify – that plaintiffs had developed lung cancer because of their exposure to polychlorinated biphenyls (PCB's).¹³⁸ Five studies were offered to support this finding: one animal bioassay and four epidemiological studies. The Supreme Court ruled that the trial judge was entitled to find that each of the studies lacked the necessary validity for drawing a reliable scientific inference regarding PCB's and whether they caused cancer. One of the studies lacked statistical significance (although the Court did not provide a gauge of the p values necessary for declaring a significant finding, leaving that determination for the authors of the study).¹³⁹ Another found a statistically significant relationship between PCB exposure and lung cancer death, but because the Japanese factory workers in that study had been exposed to other potentially carcinogenic

substances (such as rice oil), the study was invalid (again, there is no discussion of whether statistical measures for accounting for confounding variables used in the study were adequate, or how one would evaluate such a procedure).¹⁴⁰ Plaintiffs' experts were not allowed to testify as to their findings.

Indeed, challenges to expert testimony were more successful following the *Daubert* decision. One report found that rate of exclusion for “evidence based on physical science in a product liability case jumped from 53% during the two years before *Daubert* to 70% between mid-1995 and mid-1996.”¹⁴¹ A fifty-case sample of civil actions spanning three months found that 90% of the experts challenged were excluded by district judges.¹⁴² The post-*Daubert* environment, characterized by a conception of science that is more precise and exacting than the scientific method itself, posed a challenge to the residents of Kennedy Heights, whose legal counsel decided to enter mediation rather than face a *Daubert* hearing on their soil and water contamination evidence.¹⁴³

More importantly for our purposes, the methods used in Kennedy Heights for more than ten years in an effort to find a scientifically valid answer to resident concerns fed into the limiting dynamics at play during post-accident community-corporate negotiations. The results of site assessment in Kennedy Heights, where “scientific” methods were applied in a form of negotiation between a regulated entity (Chevron) and a resource-strapped and arguably inept agency (the Railroad Commission), suggest that the manner in which an accident is responded to (including a growing disconnect between resident experiences and sampling frame choices, interaction and negotiation of the process between an agency and regulated entity, and interpretation of disparate

findings through techniques such as risk assessment) and corresponding administrative actions can render resident interests inaccessible during subsequent negotiations.

This chapter sets out the story of Kennedy Heights. Rather than focus on the case that ultimately was settled by a court-appointed special master, it delves into the parallel process of investigating potential site contamination, which set the agenda and to large extent *the outcome* of subsequent mediation. The process is recounted here following extensive document review, including internal and external Railroad Commission correspondence, fieldnotes, and data, site and risk assessment documents prepared by all relevant parties, historical primary documents regarding the site's history, and interviews with a handful of "experts" charged with managing the process (from the Railroad Commission, Exploration Technologies, Inc., the Texas Natural Resources Conservation Commission, and Chevron attorneys, who spoke on behalf of the contractors who prepared the site's only comprehensive risk assessment report).

Given the standards of admissibility for scientific evidence in mass torts cases shaped by the holding in *Daubert*, the Kennedy Heights experience should give us pause before we accept the assumption, exhibited even by the final judge to preside over *Adams v. Chevron*, that such evidence must be "sufficiently established" and constitute "scientific" proof of a certain proposition.¹⁴⁴ Primary documents outlining the various efforts toward site characterization and risk assessment suggest that these processes were shaped in different ways, utilized divergent assumptions, and ultimately yielded findings that more closely resembled arguments than results. The rich history left behind by the Kennedy Heights story gives us a chance to see the tasks of site characterization and risk assessment for what they are: inherently negotiated exercises, riddled with limitations,

and bounded in terms of what they can tell the expert or the layman. Such an understanding has implications for post-accident negotiations that extend far beyond the boundaries of this single subdivision in Houston, Texas.

The Site: Kennedy Heights, Texas

Preliminary Note. Each of the following three chapters offers a case study of a different form of post-accident community-corporate negotiation. This chapter presents the results of a case study of site and risk assessment in Kennedy Heights. There are three primary rationales for conducting a single case study.¹⁴⁵ Occasionally, there will be a clearly specified theory with a set of propositions that can be tested by a single case, because the case meets each of the conditions for testing the theory. Graham Allison's *Essence of Decision* fits this description.¹⁴⁶ Allison's single case described the standoff between the Soviet Union and the United States over the siting of intermediate-range missiles in Cuba. Three competing theories were offered and compared in order to generate the best explanation for the type of crisis embodied in the conflict. Gross et al. focused on a single school in their work, *Implementing Organizational Innovations*.¹⁴⁷ The conventional wisdom had been that innovations failed because of certain barriers to innovation. Gross et al. demonstrated that, in one school, implementation processes explained the outcomes rather than barriers. The work was considered a defining moment in innovation theory. Another occasion for presenting a single case is when it represents an extreme example. This is true when a phenomenon is so rare that social scientists are unable to find common patterns, such as occurs in clinical psychology when a rare syndrome is identified. A final rationale concerns the revelatory case as single case.

A revelatory case is recommended when “an investigator has an opportunity to observe and analyze a phenomenon previously inaccessible to scientific investigation.”¹⁴⁸ In 1967, the phenomenon of living in a poor neighborhood as a black male, and the coping behaviors that were needed to deal with unemployment other challenges, was not understood. Elliot Liebow’s *Tally’s Corner* was one of the first examples of a social scientist gaining access to such a circle of individuals.¹⁴⁹ By doing so, he demonstrated through thick descriptions of the problems of unemployment how further research could be carried out. The seminal example of a combination of the theory testing and revelatory case study is *The Challenger Launch Decision*, by Diane Vaughan.¹⁵⁰ In 575 pages, Vaughan shows the inaccuracy of conventional theories for why the Shuttle *Challenger* was allowed to launch in January 1986. Through meticulous historical reconstruction based in part on over 122,000 pages of documents collected by a Presidential Commission and in part on copies of NASA original documents relevant to the incident that were stored at a warehouse at the Johnson Space Center, Vaughan showed that production pressures and managerial wrongdoing were not to blame.¹⁵¹ Rather, NASA experienced an “incremental descent into poor judgment,” where signs of potential danger were normalized in engineering risk assessments.¹⁵² Vaughan noted: “The cause of disaster was a mistake embedded in the banality of organizational life...as this book revises historically accepted interpretations, it embraces broader themes. It describes how deviance in organizations is transformed into acceptable behavior.”¹⁵³ *The Challenger Launch Decision* has encouraged an entire sub-discipline in historical sociology of disaster studies.

The story of Kennedy Heights represents a modest attempt to capture the same two rationales for a case study: by reconstructing a ten-year negotiated process which led to the results of site and risk assessment, I seek to offer an interpretation of their effects on a negotiation process. At the same time, the Kennedy Heights story is revelatory, on two levels. First, no one has told this particular story before, except when I was asked by the Environmental Protection Agency to discuss the settlement process. Second, the phenomenon of an inept agency negotiating the findings of a contaminated site investigation has been in large part inaccessible to legal scholars and social scientists. I came about the primary sources for this case study through a series of fortuitous events. While researching the settlement process that ended toxic tort litigation in this case, I was invited by a prominent law firm in the case to travel to a nearby warehouse where the entirety of their discovery and trial preparation materials had been catalogued and stored. I spent the better part of one week in the warehouse, and generated copies of the pleadings, expert reports, correspondence, exhibits, depositions, and historical documents. I supplemented these documents with more recent public records requests to the Railroad Commission and the Environmental Protection Agency, which had jurisdiction over the site. The length of the following case study is intended to offer sufficient evidence for the negotiated process that I discovered, and also to enable the researcher to consider new and heretofore unarticulated explanations for why, after ten years and millions of dollars spent on everything but site cleanup, the residents of Kennedy Heights were asked to accept the status quo and move on with their lives. I offer only a detailed reconstruction of an agency-industry negotiation, for which the former was woefully unprepared. The reasons for why the process proved asymmetric, or why the residents were and continue

to feel short-changed, are too many and varied to be sifted through and settled in one case. Still, the story is one worth telling, and in some detail. In addition to its alternative interpretation of a negotiated process and its foundation in materials that are not normally available to scholars, it represents an effort to bring what happened in Kennedy Heights to a broader audience of social scientists and concerned citizens. The residents with whom I spoke at the subdivision wanted me to share their experiences with this audience, and my extra efforts to preserve the chain of events as they occurred will be evident to the reader.

The narrative begins with a history of the site, including its transformation from crude oil storage pits to single family residential properties. The racial underpinnings of decisions to develop the property in certain ways suggest one explanation for why the residents of this subdivision, who are black, approached this process with such mistrust. Whether the racial makeup of the neighborhood contributed to the lack of action by the City of Houston for twenty years after problems began to arise is a question that cannot be answered with the materials that I encountered. How the presence of crude oil under the property was discovered is told in the next section. Then, the assessment process is reconstructed. First, the parties and their findings are listed. Early developments are described, which focused mostly on one street, Murr Way. The next section depicts the entry of the Railroad Commission and its joint efforts with Chevron, which had purchased the site from Gulf Oil and faced liability exposure for the continued presence of crude oil. Soil sampling and analysis processes, which proceeded in two stages, are then discussed. The account of site investigations conducted by multiple agencies, jurisdictions, and consulting firms will show how resource constraints and the kinds of

pragmatic considerations that they require can subsume objective analysis in the practice of site and risk assessment. Results of the first two phases of investigation varied greatly depending on the party involved, a finding that I explain by considering the sampling frame choices that were made and employed. Other dynamics at work as the site assessment process unfolded included a growing disconnect between resident concerns and the sampling designs used, interaction and negotiation of the process between the Railroad Commission and Chevron, and the interpretation of disparate findings through risk assessment methodologies developed by a consulting firm hired by Chevron. Each of these forces is described in detail.

History – The Racial Underpinnings of Site Redevelopment. The Pierce Junction oil well yielded as much as a quarter of a million barrels of oil every two months during the 1920's.¹⁵⁴ Discovered in 1921, the well was connected by pipeline to a series of pits, including three unlined, earthen storage tanks southeast of Houston, known as the Mykawa Tank Farm. Each with the capacity to hold 300,000 barrels of crude oil, the pits were located to the south of Selinsky Road and to the east of what is now Cullen Boulevard (then Chocolate Bayou Road) in the Kennedy Heights subdivision.¹⁵⁵ The northeast (NE) and northwest (NW) pits were operational and covered with lumber roofing while the southeast (SE) pit simply filled with brine.¹⁵⁶ The storage pits were partially destroyed by a hurricane that broke apart the wooden roofs covering the pits in 1927. Because of the damage as well as marginal production at the Pierce Junction field, owners Gulf Production Company (Gulf Oil) ceased operations at the tank farm.

While actual use of the property after the pits were abandoned is uncertain, it is clear that the site accommodated other land uses over the course of the next four

decades.¹⁵⁷ The pits remained visible in aerial photographs taken in 1935, 1945, 1955, and 1969.¹⁵⁸ During much of this time, Gulf Oil failed to “secure the site from the public and, as a consequence, municipal waste, junk, debris, rubbish, and hazardous substances were deposited at the site.”¹⁵⁹ In the mid-1960’s, Gulf had the site appraised and began to take steps to dispose of the property.

The appraisal documents refer to the land near the tank farm, located near Chocolate Bayou, as a “typical Negro area.”¹⁶⁰

Should this land be developed for low- to medium-priced housing with FHA or VA financing, it would have to be a bi-racial development according to present regulations. It is felt that eventually this would be the highest and best use of this property because it would then serve as a buffer between the white residential area in Crestmont Park and the heavily colored developments to the north and west.¹⁶¹

We feel by being surrounded by negro subdivisions this property is committed to a use, either for subdivision purposes or other, by this element. Eventual industrial use may be foreseeable; although, this seems unlikely with the nearest trackage available two miles away.¹⁶²

Such references to the social demographics of the area are striking. Yet they mask a more important distinction that was made in appraisal documents for the tank farm. Prior to sale of the property, developers began to figure out the appropriate cost of the land purchased with the storage tanks filled, *after* their contents (“sludge,” or the remnants of stored crude oil¹⁶³) were removed.

The present worth of subject property is its market value less the cost of draining, filling, and leveling the three large open tanks. Mr. R. Salmon, a dirt moving contractor, estimates it will take 3 months or longer to do this work, at a cost of \$2,500 per tank. Mr. Neville of Humble figures his cost at \$1,500 per acre of tank on some tanks in Humble that have as much as six feet of B.S. & W. These tanks are approximately 400 feet square, and it is felt that \$5,000 per tank is a safer estimate of cost, as it is not known how much experience Mr. Salmon has actually had in this type of work. Like Mr. Neville, Mr. Salmon would spread out the sludge on the land to dry. It is felt that land east of Chocolate Bayou Road will not sell as high as land adjoining a present residential development, especially where this land will have to be developed as a buffer zone between colored and white areas. For the above reason it is felt that the price being asked for the 29 acres fairly well represents the price at which a residential developer would buy subject property, if it were in its original condition and free and clear of tanks.¹⁶⁴

Highest and best use: The most profitable use for this land appears to be for medium priced houses for white occupancy, with a 200-foot-wide commercial strip fronting on Chocolate Bayou Road as a buffer strip against the all colored Cloverland Subdivision on the west side of Chocolate Bayou Road.¹⁶⁵

This area is both colored and white, with Chocolate Bayou Road serving as the dividing line. Because of colored settlements across the road to the west the highest and best use for this land appears for low cost homes for white occupancy. The three large open earthen pits on the land will have to be filled before subdivision work can proceed on all the land. This may cost from \$2,500 to as much as \$5,000 per tank.¹⁶⁶

For six years, Gulf Oil “unsuccessfully attempted to dispose of this acreage.”¹⁶⁷

The company then began negotiating with John Lester, President of Log Development Company, who was interested in “acquiring the site for a Negro residential and commercial development.”¹⁶⁸ In 1968, Gulf Oil conveyed the site to Log Development.¹⁶⁹ The transaction involved a tax-free exchange of the Pierce Junction Tank Farm (valued at \$274,107) for the northwest corner of Richmond and Montrose Streets, in Houston.¹⁷⁰ Log Development did not remove any tank bottoms in the area of the earthen tanks utilized by Gulf, a practice that had been suggested for the property when it was assumed that it would become a white subdivision.¹⁷¹ Lester simply had the berms along the sides of the pits pushed inward, filling the pits.¹⁷² The Kennedy Heights subdivision physically replaced the Mykawa Tank Farm in the late 1960’s.

Residents Discover the Problem. The name of the subdivision, its location, the way it was marketed, and documents obtained from Log Development suggest that in the end, the homes built were targeted at below-middle-income African-American buyers. The subdivision was quickly filled by new homeowners. However, several aspects of the subdivision seemed “off” to the new residents. Sidewalks and backyards began to buckle and sink. Residents noticed putrid smells and strange colorations in their tap and bathwater. Some even experienced diseases that were not in their family histories,

including multiple forms of cancer as well as lupus. One resident had to cope with four different forms of cancer nearly simultaneously.

Well, what I remember though, when I was a kid, we used to crawfish in the ditch behind the house, and I remember the soil had like four or five different levels. It was like orange, purple, blue, and I guess reddish, plus the dirt on top. But as a kid, I didn't know what it was.¹⁷³

I've been in Kennedy Heights for 30 years. I waited for my house to be built over there, so that's how long I've been here. And as having young kids there, the water has always been bad. We tried putting water filters, everything on the water. And really I wish I would have kept the filters. Because the filters that we would take out, it was filled with oil and green gook and everything else. So finally it got so bad to where we were afraid to drink the water even with filters. We changed filters 2-3 times a month and it still was bad, so we had to start buying water to drink. And we've always had dogs in the backyard. And every dog we've had, anytime they would dig, they would die. At first we thought somebody was poisoning them. But after we looked at it, anytime they would dig deep in the yard, they would die. So every dog we had in the back, that's what happened to them. And we had a pear tree in the back and it was like one side of it would bear pears and one side wouldn't. So the side that didn't bear pears, that's where the dogs would dig all of the time and evidently there was something there.¹⁷⁴

There's too many deaths for the amount of people. And that's what got somebody's attention. That too many people were getting sick and dying. And there were too many abnormalities and birth defects in people. I mean, you know, even whole households, everybody was sick. You know, not just one.¹⁷⁵

Like on my side, it was like every other house, somebody had died of cancer. You don't tell me that's normal. That's not normal. [The special master] was trying to tell us that that was normal in a neighborhood. It's not. This was just on one side, within a block. I'm not talking about the other side, or down the street. Just one side. You're talking about 12 houses and every other house, somebody has died with cancer.¹⁷⁶

An additional concern focused on the water lines under subdivision properties, which would continuously rupture. One resident, a school teacher, recorded important events on the inside cover of her husband's Bible:

Lord help us. We are your children. God, seems like the water is making Albert sick. Lord help him.
September 12, 1971. The water has broken again.
October 4, 1971, water break.
October 22, 1971, water break. The water smells real bad today. It's yellow-looking. What are we going to do?
April 5, 1972, water break.
April 26, 1972. The pipes are rusty, the workers said to let the water run a long time.
July 1973, the water has broken again. Albert is sick. Lord, I have called the city. They won't fix the water.
April 1975, water breaks.
June 1975, water breaks.
December 1975 water break.
May 1976, water breaks.
November 12, 1976, water breaks.
January 1, 1977. New Year's Day. The water breaks. I can't cook.
January 20, 1977, water breaks again.
May 10, 1977, water breaks.

May 8, 1978. City put in a blue plastic pipe. Hope it will hold.
This is May 3, 1981. The pipes burst.
Oh, God. The pipes are bursting.
Feb. 4, 1982. Pipe burst.
June 19, 1983. Pipe burst. I can't cook. Lord, what's next?¹⁷⁷

Residents registered complaints about the water main breaks for twenty years, yet Houston's Capital Projects Department did not begin major work on pipe excavation and replacement until the early 1990's.¹⁷⁸ A contractor, Pas-Key Construction Services, was sent by the city to excavate a site on Murr Way in order to replace some of the waterlines. On September 18, 1991, the contractor shut down the site when a worker collapsed during site excavation. Other employees remarked that there was a creosote odor in the area and complained of eye irritation.¹⁷⁹ The workers left a sizable hole in the ground and "ceased all construction operations until further notice from the City of Houston Health Department."¹⁸⁰ Residents began to wonder why the work had ceased. Perhaps the pipe replacements were part of a broader effort to increase the number of units available within the subdivision, as word spread that a low-income housing development was in the planning stages.¹⁸¹

The Assessment Process: Ten Years and Few Answers

Unbeknownst to the residents, the City of Houston hired a contractor to investigate potential petroleum contamination at the site. Thus began a disjointed process convened by regulators and private industry, lasting more than ten years, to assess whether Kennedy Heights residents were exposed to dangerous levels of a variety of toxicants, including Polycyclic Aromatic Hydrocarbons (PAHs) (some of which are known carcinogens).¹⁸² Efforts to characterize the risks faced by local residents included:

- A contractor hired by the city carried out soil borings drawn along the water main replacement route at 0-10 feet, finding contamination at a depth of 2-7 feet, including petroleum hydrocarbons;

- The city of Houston analyzed samples taken from two water mains near Murr Way, and found “no contamination of the potable water supply system”;
- A Texas Water Commission official arrived to conduct a site inspection, but because the excavated site had been filled in, he was not able to take samples;
- Pas-Key, the consultant hired to replace some of the waterlines hired a consultant who found “creosote mixed with crude oil which will cause skin rash, dermatitis, and breathing difficulties”;
- John Hanby, a consultant hired by the Kennedy Heights Civic Association, found “extremely high levels of petroleum-related chemicals” in the soil, with concentrations “several times higher than the city’s highest reading”;
- American Home Dream Corporation requested an investigation of potential contamination at the site of a proposed additional 53 units within Kennedy Heights;
- The Railroad Commission assessed the neighborhood in 1994, by reviewing results of the city Health Department’s earlier tests for contamination and above-ground visual survey. Based on the city’s data, the RRC concluded that there was no basis for the initiation of cleanup activities;
- In 1995, the Railroad Commission and Chevron met to discuss the site in response to resident complaints and threatened litigation. Chevron proposed a Methane Investigation plan in September;
- In 1996, Chevron proposed a Comprehensive Work Plan for Kennedy Heights;
- Methane testing ended with samples showing a maximum of 23,000 ppm methane at 5 feet, taken in an area where plaintiffs also encountered high levels. Railroad Commission personnel reported that surrounding tests indicated that such high concentrations were localized;
- By the close of the investigation, led and in many respects managed by Chevron, concentrations of hydrocarbons as high as 29,000 ppm were found;
- Exploration Technologies, a consulting firm hired by the resident-plaintiffs, found levels of hydrocarbons as high as 32,060 ppm, in addition to “liquid product” (crude oil) at several locations;
- In March 1996, the Railroad Commission met with Chevron to discuss the second phase of the investigation, the goal of which was to conduct a detailed toxicological risk assessment to address the presence and distribution of contaminants, any exposure risk to residents, and surface or subsurface water pollution. Again, the process was managed by Chevron and subject to severe budgetary constraints by the Commission; and
- An informal survey taken by John Simmons, president of the Civic Association, showed that there were 113 cases of cancer, brain tumors, lupus, and birth defects in the subdivision’s 325 homes. The prevalence of systemic lupus erythematosus in Kennedy Heights was calculated by an epidemiologist from Boston University, who found it to be between 4.9 and 8.2 times the upper end of the SLE prevalence range in the U.S. population.

Some of the data gathered were used years into the process by residents’ legal counsel to piece together a narrative for use in litigation against Chevron, which had acquired the property from Gulf Oil prior to its conversion to residential property.¹⁸³ The residents’ narrative proceeded as follows: during periods of depressurization, caused when breaks in the pipes under Kennedy Heights occurred, contaminants entered the water pipes, located at a depth below the surface where some of the highest levels of contaminants were found. Water main breaks occurred within Kennedy Heights at a rate of 20-30 breaks per mile per year.¹⁸⁴ The contaminants included several known animal

carcinogens, including a number of aromatic hydrocarbon compounds. One of the areas of the body affected by exposure to polycyclic aromatic hydrocarbons is the immune system.¹⁸⁵ Lupus, a disease in which the immune system loses its ability to tell the difference between foreign substances and its own cells and tissues, was prevalent in Kennedy Heights at a rate several times the national prevalence rate.¹⁸⁶ Other diseases linked to some of the known or suspected carcinogens in the soil were also prevalent in the subdivision.

Despite years of sampling and assessment and a trial that advanced through thirty-one days of testimony (ending in a special master-driven settlement), to date no work has been carried out to replace the pipes under their subdivision or remove any remnants of the Mykawa Tank Farm. Some residents continue to believe that the City is reluctant to act, because “if they dig, they’ll find something else.” The final official word on the subject of contamination at Kennedy Heights was offered by the Environmental Protection Agency, which in response to continued resident complaints performed an Expanded Site Inspection in August 1998 and concluded its work in 2001, declaring that the site did not meet criteria for listing on the National Priorities List.¹⁸⁷

It is no surprise that the level of uncertainty over even the existence of contamination remained high throughout much of the ten year struggle, given the range of estimates derived from the various efforts listed above. Yet these highly technical procedures, coordinated by state and federal agencies in cooperation with Chevron, consumed most of the resources devoted to investigating residents’ claims, and determined which of their interests would be folded into the mediation process that followed.

The Site Characterization Process Described

The Early Focus on Murr Way. Site characterization began in September 1991, when the city of Houston hired a contractor (Lockwood, Andrews, and Newnam, Inc. [LAN]) to investigate potential petroleum contamination in the subdivision. This occurred after personnel sent to the site by the city noted a “creosote like odor in the air” and found trihalomethanes (a volatile organic compound) and evidence of the possible occurrence of trichloroethylene.¹⁸⁸ Soil borings drawn along the water main replacement route at 0-10 feet found contamination at a depth of 2-7 feet, including petroleum hydrocarbons “not normally indigenous to surface soils.”¹⁸⁹ While the city’s analysis of samples taken from the two water mains near Murr Way (where Pas-Key work had ceased) suggested “no contamination of the potable water supply system,” LAN, Inc. found concentrations of total petroleum hydrocarbons (TPH) above levels recommended by the Texas Water Commission (TWC) for soil contamination.¹⁹⁰ The city’s Director of Health and Human Services also argued that replacement of water lines should continue, to allow for “higher water pressure” that would “decrease the probability of groundwater infiltration.”¹⁹¹

The full results of the city’s testing efforts were not shared with residents or the contractor.¹⁹² The Texas Water Commission (TWC), Texas Railroad Commission (RRC), and regional office of the Environmental Protection Agency, on the other hand, were contacted. A TWC official arrived to conduct a site inspection, but because the excavated site had been filled in, he was not able to take samples (according to what are now TNRCC guidelines).¹⁹³ Residents, who had begun to meet as part of the Kennedy Heights Civic Association, formed a Contamination Committee and collected money to

pay for their own environmental consultant. Pas-Key also hired a consultant to investigate the site. By January 1992, the contractors hired by Pas-Key found that “the contaminant is creosote mixed with crude oil which will cause skin rash, dermatitis, and breathing difficulties.”¹⁹⁴ Four streets were listed as affected by the city’s sampling activity, although until this point contractors had focused predominantly on the excavation area.¹⁹⁵ A contractor hired by the residents found even higher levels of polyaromated hydrocarbons in the soil.¹⁹⁶ At around the same time, the TWC changed its policy for analyzing hydrocarbons, eliminating a former method for analyzing total petroleum hydrocarbon in water, land, and waste.¹⁹⁷

The pace of activity picked up in 1994-95, when American Home Dream Corporation requested an investigation of potential contamination at the site of a proposed additional 53 units within Kennedy Heights.¹⁹⁸ The contractor, RRC, and Chevron met to discuss the results, starting a trend where environmental scientists, regulators, and the regulated would meet regarding the site, at times without the input of the affected community. Meanwhile, John Simmons, who headed the Kennedy Heights Civic Association at the time, began an investigation of his own, finding enormously high rates of cancer and lupus through an informal survey of the subdivision’s 325 homes.¹⁹⁹

Chevron-Railroad Commission Joint Efforts. The Texas Railroad Commission (RRC), which held jurisdiction over petroleum spills and deposits in Texas, initially investigated the Kennedy Heights neighborhood in 1994, by reviewing results of the city Health Department’s earlier tests for contamination and above-ground visual survey.²⁰⁰ Based on the city’s data, the RRC concluded that there was no basis for the initiation of cleanup activities.

To encourage regulatory action, residents began a letter writing campaign in August 1995, sending letters to the TNRCC and the RRC which urged them to investigate the reported contamination under their homes.²⁰¹ An attorney representing John Simmons and other families (approximately 2,000 individuals at the time) also presented a letter to the Chairman of RRC containing 68 pages of signatures and citing findings of “explosive levels” of methane gas under certain homes. RRC involvement began in earnest on August 23, 1995, when Commission and Chevron representatives met to discuss the site. As much of the emphasis of residents (which led to a motion for temporary injunction against the new contractor) focused on the threat of explosive levels of methane, Chevron proposed the installation of several gas monitoring wells in areas where high levels of subsurface methane had been previously identified.²⁰² According to Chevron, the testing would “assist in identifying the source of the gas” and to inform the applicability of surveying homes in the subdivision for gas concentrations within the residences.

Chevron presented its initial Methane Investigation Proposal to the RRC in September 1995. The proposal called for three gas monitoring wells that would use push tools in areas of “highest reported gas concentrations” (as found by residents’ contractors²⁰³) to take samples at two-foot intervals (vertical).²⁰⁴ The sample with the highest TPH reading for each well would undergo additional testing for PAH’s, metals, volatiles, semi-volatiles, and hazardous characteristics. In addition, 12-15 soil borings were to be taken to a depth of 4 feet to test for lower explosive limits of methane, CO₂, and O₂. This was the first of several attempts by Chevron to measure the extent of contamination in Kennedy Heights. They were based on a series of assumptions that

were contested by local residents. Tables 1 and 2 provide the primary concerns raised by RRC staff and residents during testing at the subdivision.

Table 1. RRC Concerns Regarding Chevron Sampling Proposals for Kennedy Heights.

Chevron Proposal	Date	RRC Concerns
Methane Investigation Proposal (resubmitted as Installation of Gas Monitoring Wells for the Measurement of Methane Concentration and Flux Rates from Soil)	September 9, 1995 (revised October 11, 1995 and resubmitted December 7, 1995)	<ul style="list-style-type: none"> • Need to provide estimated time frame for conclusion • Clarify volumes to be evacuated through tubing • Provide approximate location of proposed 12-15 in-situ borings • Expand on reasons for limiting the shallow borings to a depth of four feet • Comment on whether Chevron still plans to pursue determination of the origin of the methane gas • Comment on why intervals of one and two months for sampling were chosen²⁰⁵
Comprehensive Work Plan for Kennedy Heights Subdivision	October 18, 1996 (3 rd Draft)	<ul style="list-style-type: none"> • Should include conceptual site model and data quality objectives that will explain purpose of various aspects of plan • No deep monitor wells planned within pit boundaries, the most likely site of groundwater contamination – install within each of northern pits • Justify sampling frequency and intervals • Need rationale for number of drinking water samples, residences being tested, and timing of samples • How will locations for line break sampling be identified • Explain difference in analyte list for line break areas and the testing of tap water • Methane sampling should use statistically valid representative number of residential foundations at NE pit • Provide details for beneath-slab methane testing, standard procedures for such testing, statistical analysis for #, location of methane background sampling points • Additional samples needed in utility backfill zones • Should focus on genesis and pathways of methane; consider testing additional gases • Will Chevron conduct ambient air sampling in interior of all residences over NE pit? • Explain how proposed soil sampling will provide sufficient data for a credible risk assessment, particularly in shallow zones²⁰⁶

Table 2. Resident Concerns Regarding Chevron Sampling Proposals for Kennedy Heights.

Chevron Proposal	Date	Resident Concerns
<p>Methane Investigation Proposal (resubmitted as Installation of Gas Monitoring Wells for the Measurement of Methane Concentration and Flux Rates from Soil)</p>	<p>September 9, 1995 (revised October 11, 1995 and resubmitted December 7, 1995)</p>	<ul style="list-style-type: none"> • Vapor phase hydrocarbons are from 2-11 feet with random, thin, and discontinuous distribution • Pockets of liquid and residual hydrocarbons are at 5-26 feet; sampling is too shallow at 4-10 feet • Three wells is inadequate • Need in-situ and discrete samples with depth instead of 5 foot screens, to avoid dilution of samples • Samples will vent; will not be able to measure concentration, generation, or flux • Should test for a greater variety of PAH's • Vertical averaging will depress values • Fractures in clay can intersect methane pockets, allow gas to migrate to homes with cracked slabs • Methane will be generated until food source (hydrocarbons) is removed²⁰⁷ <p>Concerns post-investigation:</p> <ul style="list-style-type: none"> • Systematic tight grid approach not used • Chevron "abandoned" sampling if no results, reported "no vapor" when should state "no sample" • Calculations for generation of methane based on inappropriate assumptions • Soil descriptions, video tapes do not support statement that grass roots caused elevated levels of methane • Comments that subsurface methane would render landscape barren are unsupported • Neglects methane accumulations beneath foundations²⁰⁸
<p>Comprehensive Work Plan for Kennedy Heights Subdivision</p>	<p>October 18, 1996 (3rd Draft)</p>	<ul style="list-style-type: none"> • TNRCC regulations for residential exposure limits should be considered to determine acceptable levels of contamination • TNRCC should be involved due to the presence of chlorinated hydrocarbons • Chevron uses random rather than systematic sampling and too few samples within pits • There is no effort to locate the boundaries of the former pits • Monitor wells are too shallow at 5 feet • Chevron attempted to abandon a sampling effort in previous testing • Further testing should include tight grid of 50 feet for soil borings, borings where ETI sampled, borings and wells up to 14 feet, mapping of petroleum contaminated soils, testing for TPH using methods 418.1 and GC 8015B (before this only used 418.1)²⁰⁹

Residents' representatives and RRC staff were able to comment on several iterations of Chevron proposals, although this process was at times disjointed. RRC records indicate that meetings to discuss sampling efforts were held exclusively among Chevron and RRC representatives.²¹⁰ As sampling began, RRC and resident representatives were present to observe and record (by video tape) Chevron's efforts and to split samples for their own analysis when desired.²¹¹ The RRC adopted a statistical sampling frame for split samples, in addition to the splitting of samples with visible contamination.

On December 7, 1995, an RRC staff member was told that he had the authority to contract for equipment and materials that would be needed to analyze the soil samples for methane gas and other contaminants that RRC planned to split with Chevron. The official was also told, "It is understood that the cost of this operation shall not exceed \$2,500."²¹² At the same time, an attorney for the plaintiffs requested that the RRC observe certain sampling efforts on behalf of the residents.²¹³ Some of the final preparations made by RRC included coordinating plans for responding to media interest. Interoffice correspondence regarding sampling activities would often include a characterization of media interest and any RRC response. Before testing started, Chevron's public affairs representative was told by an RRC official that his plan was to "respond to media inquiries about RRC monitoring roles but to refer questions about the testing, sampling, analysis, timetable, etc. to him."²¹⁴ By December 15, Chevron's methane investigation was ongoing with what had become four gas wells installed.²¹⁵

Testing continued at predetermined intervals from mid-December 1995 to February 15, 1996. Preliminary data yielded 4,000-5,000 parts per million methane

recovered from the monitor wells over the pits. This was far below the level that RRC considered “explosive” (50,000 ppm) but it was believed to be “a greater concentration than Chevron anticipated measuring.”²¹⁶ Data also showed 2 of 25 samples in excess of 1% TPH.²¹⁷ As Chevron periodically repeated its sampling procedures, a ritual ensued where RRC Site Remediation personnel would unlock the wells, monitor sampling activities along with plaintiffs’ representatives, and request split samples when visual contamination was noted. Occasionally, problems were reported. For example, instrument problems at the laboratory used by RRC meant that certain samples had to be shipped to a Corpus Christi lab for analysis.²¹⁸ These samples were shipped to Corpus Christi, then to Louisiana, and then back to Corpus Christi.²¹⁹ RRC officials questioned the integrity of such samples, and were told that there would be no charge for them.²²⁰ On another occasion, Chevron told the other parties that a sample was insufficient and wanted to re-sample. RRC representatives noticed visible contamination in the sample “and insisted and received split samples with residents.”²²¹ Another problem concerned the effects of the wells themselves on samples and readings for methane. In mid-January 1996, field reports indicated that 3 of the 4 monitoring wells had partially filled with water. RRC officials indicated that they would ask Chevron about “what effect the water is having on the integrity of the testing.”²²²

Methane testing ended with samples showing a maximum of 23,000 ppm methane at 5 feet, taken in an area where plaintiffs also encountered high levels. RRC personnel reported that surrounding tests indicated that such comparatively high concentrations were localized.²²³ Elevated TPH was found at levels up to 5,990 parts per million (recall

that preliminary data in two samples showed 10,000 ppm, or 1% TPH).²²⁴ By the close of the investigation, the highest concentrations of TPH found by Chevron and RRC were 29,000 ppm and 24,000 ppm, respectively. Exploration Technologies, Inc. (a consulting firm hired by the plaintiffs) found levels as high as 32,060 ppm, in addition to “liquid product” (crude oil) at several locations.²²⁵ It is difficult to draw conclusions directly from these numbers, particularly since the finding of liquid product was never officially verified by the RRC. For instance, a 1993 RRC rule provided for cleanup of “non-sensitive” areas when TPH levels exceeded 10,000 ppm.²²⁶ Kennedy Heights was a sensitive area, implying that a lower threshold should be applied, albeit with adherence to specific risk-based decision making rules and procedures.²²⁷ This was suggested by RRC District Manager Guy Grossman.²²⁸ However, the rule (Statewide Rule 91) did not apply to spills that took place before November 1, 1993. For spills that did qualify for cleanup under the rule, RRC provided the following advice:

Statewide Rule 91 distinguishes two categories of spills: (a) crude oil spills into non-sensitive areas; and (b) (i) hydrocarbon condensate spills and (ii) crude oil spills in sensitive areas. Rule 91 establishes clear goals for cleanup of crude oil spills in non-sensitive areas: immediate removal of all free oil, immediate vertical and horizontal delineation; specifying the “area of contamination” that must be delineated and disposed of or remediated, and specification of a final cleanup level of “1% by weight TPH.” Rule 91 is less clear about the second category of spills. It stands to reason that hydrocarbon condensate spills and crude oil spills in sensitive areas, which pose greater risks, should at least follow standards established for the equally important but less threatening spills.²²⁹

Yet the same residential and industrial limits are given for TPH and BETX, a group of particularly toxic compounds associated with the processing of crude oil (benzene, ethylbenzene, toluene, and xylene).

In March 1996, RRC met with Chevron to discuss the second phase of the investigation. Chevron’s plan included an evaluation of all three former pits with ten shallow groundwater monitoring wells, 33 hollow stem auger soil samples, and 24 cone

penetration tests. The overall goal of this phase of the investigation was to “conduct a detailed toxicological risk assessment that will address the presence and distribution of contaminants, any exposure risk to residents, and surface or subsurface water pollution.”²³⁰ Sixty days of fieldwork were planned to gather data that would allow for a more comprehensive investigation of site contamination. RRC and Chevron worked out field operations so that representatives would be present for surveying, probing, and sampling. Again, RRC officials describe budgetary constraints that “will limit us to five samples.”²³¹ The parties started with the northwest pit for one week, and then moved into the neighborhood.

Phase II of the RRC-Chevron Investigation Commences. In response to concerns about drinking water, Chevron’s Comprehensive Work Plan was drafted to include a proposal to collect samples from the outside hose bibs of 13 selected homes “as soon as reasonably possible, but no later than 24 hours after a water line break has been repaired in the Kennedy Heights subdivision.”²³² The company also offered free drinking water testing to residents whose homes were located in the general area of the northeast pit. Plaintiffs were opposed to the sampling program, claiming that it was “unlikely to detect contamination at any home not affected by a specific pipeline break.”²³³ More importantly, it would have “limited utility in determining how much contaminated water has entered homes in Kennedy Heights during the last twenty-five years.”²³⁴ The Houston District Office of RRC was forwarded approximately 80 letters from residents, originally mailed to the TNRCC, requesting cleanup of contamination at Kennedy Heights.²³⁵ Fifty residents attended a technical meeting regarding Chevron’s Work Plan, again questioning the risk assessment and its ability to appropriately characterize

sporadic contamination entering residential lines after water main breaks.²³⁶ At a pre-hearing conference in Houston, residents' attorneys claimed that the hearing process lacked clear ground rules, standards, or a clear burden of proof.²³⁷ The residents withdrew from the hearing, but implored RRC to continue its efforts, citing "ample technical data available to support enforceable remediation measures."²³⁸

Comparison of Results by Party. Upon conclusion of sampling over each pit by the various consultants, RRC prepared summaries of contamination found. Tables 3-5 provide an overview of the highest concentration of several compounds of interest, as summarized by RRC.

Table 3. Highest Concentration Found as Proportion of TNRCC Regulatory Limit, NE Pit (ppm).

	Chevron	RRC	ETI	City	PSI
TPH at Surface	1,453	800	7,797	590	-
TPH	29,000*	24,000*	9,720	-	-
VOC	43.49*/10.7 (Methylene Chloride)	-	.212*/1.33 (Benzene) 25/1.0 (Toluene)	-	-
S-VOC	39.18/45.7 (Bis 2-ethylhexyl phthalate)	-	33*/.00608 (Bis 2-ethylhexyl)	-	2.649*/.00608 (Bis 2-ethylhexyl)
Total Metal	11.7*/.366 (Arsenic)	-	2.5*/.366 (Arsenic)	-	.450*/.366 (Arsenic)
SPLP VOC	2.99*/.005 (Methylene Chloride)	.009*/.005 (1,2 dichloroethane) .037/.005 (Methyl Chloride)	-	-	-
SPLP S-VOC	.021*/.006 (Bis 2-ethylhexyl phthalate)	-	-	-	-
SPLP Metal	.24/2.0 (Barium)	.004*/.002 (Mercury) 1.7/2.0 (Barium) 2351*/300 (Sulfates)	-	-	-
DW VOC, S-VOC, Metal	-	-	-	-	.016/.1 (Chloroform), .012* /.00608 (Bis 2-ethylhexyl), .001/.05 (Arsenic)

TPH = Total Petroleum Hydrocarbons

VOC = Volatile Organic Compound

S-VOC = Total Volatile Organic Compounds

SPLP = Synthetic Precipitate Leaching Procedure, a method to determine the mobility of compounds in soil

DW = Drinking Water

- = no hit or test for this compound

* = above TNRCC regulatory limits (number below / represents limit); numbers for TPH with a * are above RRC guidelines for non-sensitive areas; at the time, sensitive areas were assessed on a case-by-case basis

Table 4. Highest Concentration Found as Proportion of TNRCC Regulatory Limit, NW Pit (ppm).

	Chevron	RRC	ETI
TPH at Surface	3,674	1,100	636
TPH	23,450*	18,000*	32,060*
VOC	36.63*/10.7 (Methylene Chloride)	-	-
S-VOC	19.39/45.7 (Bis 2-ethylhexyl phthalate)	-	33*/.00608 (Bis 2-ethylhexyl)
Total Metal	11.4*/.366 (Arsenic)	-	2.5*/.366 (Arsenic)
SPLP VOC	4.07*/.005 (Methylene Chloride)	-	-
SPLP S-VOC	.0068*/.006 (Bis 2-ethylhexyl phthalate)	-	-
TCLP Metal	-	1.2/2 (Barium) 303*/300 (Sulfates)	-

TPH = Total Petroleum Hydrocarbons

VOC = Volatile Organic Compound

S-VOC = Total Volatile Organic Compounds

SPLP = Synthetic Precipitate Leaching Procedure, a method to determine the mobility of compounds in soil

TCLP = Toxicity Characteristic Leaching Procedure, an analytic method to determine metal mobility

- = no hits or test for this compound from samples taken

* = above TNRCC regulatory limits (number below / represents limit); numbers for TPH with a * are above RRC guidelines for non-sensitive areas; at the time, sensitive areas were assessed on a case-by-case basis

Table 5. Highest Concentration Found as Proportion of TNRCC Regulatory Limit, SE Pit (ppm).

	Chevron	RRC	ETI
TPH at Surface	24	200	31
TPH value	31	200	8
VOC	5.99/10.7 (Methylene Chloride)	-	-
S-VOC	6.99/45.7 (Bis 2-ethylhexyl phthalate)	-	-
Total Metal	12.1*/.366 (arsenic)	-	-
SPLP VOC	4.14*/.005 (Methylene Chloride)	-	-
SPLP S-VOC	.01198*/.006 (Bis 2-ethylhexyl phthalate)	-	-
TCLP Metal	-	2678*/300 (Sulfates) 305*/300 (Chlorides)	-

TPH = Total Petroleum Hydrocarbons

VOC = Volatile Organic Compound

S-VOC = Total Volatile Organic Compounds

SPLP = Synthetic Precipitate Leaching Procedure, a method to determine the mobility of compounds in soil

TCLP = Toxicity Characteristic Leaching Procedure, an analytic method to determine metal mobility

- = no hits or test for this compound from samples taken

* = above TNRCC regulatory limits (number below / represents limit)

While compounds were found at levels exceeding regulatory standards for both declared and suspected human carcinogens, the RRC determined, through analysis of a risk assessment performed by Chevron, that the levels of contamination did not pose a sufficient threat to human health to warrant remedial action. Prior to completion of Chevron's Work Plan, the RRC responded to concerns expressed by State Senator Rodney Ellis regarding the anticipated risk assessment. The Assistant Director of the Environmental Section of the RRC characterized risk assessment as follows:

No single risk assessment model will account for site-specific variables in all cases, including those at Kennedy Heights. However, risk assessment techniques are designed to be adjusted to accommodate site-specific variables. Commission staff has experience evaluating site-specific risk assessments, including assessments of risk to nearby residents from surface and subsurface contaminants. If a thorough risk assessment of the residual contamination at Kennedy Heights

indicates that the residents are or may be exposed to constituents of concern at unacceptable levels, appropriate remedial measures will be required.²³⁹

RRC's evaluation of Chevron's risk assessment led them to conclude that residents were not exposed to unacceptable levels of hydrocarbons, a finding echoed years later in the EPA's risk assessment. Residents were left to seek relief through the courts.

The Limiting Effects of Site Characterization and Risk Assessment in Kennedy Heights

The above account of the site investigations conducted by multiple agencies, jurisdictions, and consulting firms represents only one of many sides of the Kennedy Heights story.²⁴⁰ The value in piecing together this particular sequence of events lies in its demonstration of how pragmatic considerations as well as uncertainty can overshadow objective analysis as parties move to investigate a contaminated site. In addition, the assessment dynamics at play can be shown to remove from consideration resident understandings of the problems they face, making it difficult to assert their ideas during a dispute resolution process. The primary dynamics at work as the site assessment process unfolded in Kennedy Heights included (a) a growing disconnect between resident concerns and sampling frame choices made by contractors, (b) RRC/Chevron interaction and negotiation, and (c) the interpretation of findings from the first two phases of the investigation through risk assessment methodologies developed by consulting firms for Chevron.

The Importance of Sampling Frame Choice. Much of the variance in results gathered by parties conducting soil sampling in Kennedy Heights can be attributed to the choice of sampling frame²⁴¹ by each consulting firm. Recall the difference of opinion

among RRC, residents, and Chevron as the parties set up the Methane Investigation Proposal and Comprehensive Work Plan. Prior to the start of the Methane Proposal, RRC expressed doubt over the time frame, volumes to be collected per tube, approximate location of the soil borings (which Chevron did not specify), Chevron's rationale for limiting its samples to four feet (when initial findings were at least in the 2-7 foot range), its decision to sample at intervals of between one and two months, and the absence of any plan to determine the origin of the gas. Residents shared some of these concerns, particularly because of their findings of vapor phase hydrocarbons at 2-11 feet "with random, thin, and discontinuous distribution" as well as pockets of liquid hydrocarbons at 5-26 feet. There was clear concern over the possible dilution of samples, which led residents to propose an in-situ as opposed to a 5 foot screen approach and to predict that the wells would vent, fill with rainwater, and necessitate vertical averaging that would further depress values. Chevron only set up four gas wells for use over 13 months, three of which filled with water. The RRC's only recorded response to this was to note that they would ask Chevron about its effects on sample integrity.

Residents reiterated their concerns post-sampling as well. First was the fact that that Chevron did not use a grid approach commonly applied by the industry. Consultants for the residents employed this approach, which was described by a scientist at Exploration Technologies, Inc.

We began with a, it might have been a 50 foot sampling grid, and what we did was map the various components, the methane, ethane, propane, butanes, and what we call C5+, the pentanes through xylene plus hydrocarbons, and of course the methane turned out to be the best indicator, again, the anaerobic degradation product of the crude oil, and what it indicated to us, and the purpose of doing the soil gas survey was to determine or delineate the aerial extent of the contamination in the subsurface...we do this first, because we do not want to go out and install borings and/or install monitoring wells at random.²⁴²

There were also problems with sampling decisions made *during* the 13 month period. Residents protested the fact that Chevron recorded abandoned sampling efforts as “no vapor” instead of “no sample” and based their entire sampling frame on methane generation assumptions that were not shared by residents or the RRC. Perhaps most troubling to residents was Chevron’s neglect of methane accumulations under housing foundations. Questions such as where to locate soil borings, what depths of the soil they should reach, and how often they should be collected are closely tied to the narrative of contamination that one is trying to construct. The narrative for soil gas location was articulated by representatives of the community as follows:

We did a 50 foot grid, but those little insets indicate that the contamination was so, I don’t want to use the term random, but unpredictable, because what happened was they had these pits dug, and what they dug out they put as a berm around the pits. They filled the pits to well beyond the pit itself so that actually the crude oil was up into the berms. When they were ready to close those pits, they just bulldozed everything back into the pits. So if you can imagine, the best analogy I can give you is a vanilla and chocolate marble cake. So when they bulldozed all the berms back into the pit, now what you have is your chocolate is your product, or your crude oil saturated soils, that are now mixed in with your vanilla, which is less contaminated or possibly uncontaminated soils, so it’s very difficult to predict where these pockets of product exist...we did some drilling, bore hold drilling after we finished our soil gas survey and we did it based upon our soil gas anomalies and I personally was present and collected samples on three particular bore holes which were drilled four feet apart. One on the, off the sidewalk but on someone’s lawn, then moved over four feet to the west, and both were contaminated, the cores were dripping crude oil, moved over four feet again, and got nothing. That’s how quickly you could go from contaminated soil to relatively clean soil.²⁴³

The possibility that soil gas locations could be randomly dispersed across the subdivision led scientists hired by the residents to express concern over the likelihood of methane pockets. When reaching a level indicative of explosive potential, methane pockets would be extremely dangerous if located under single family homes. Yet the Chevron Methane Investigation Proposal and the Comprehensive Work Plan did not outline a plan to test housing foundations. Nor did they account for possible exposure to vapors from degrading crude oil (in the form of ambient air sampling inside the homes located over the pits), the transport of hydrocarbons from the soil to residents’ drinking water through

water main breaks (by providing a random drinking water testing throughout portions of the subdivision following a line break), or the discontinuous location of hydrocarbons and other soil gases (that could only be characterized through grid sampling).

Collectively, these early choices by Chevron, questioned by the RRC but ultimately accepted, meant that resident understandings of their subdivision and fears regarding possible exposure pathways (drinking water/showers following pipe ruptures, inhalation from sub-foundation soil entering homes) and dangers (explosive levels of methane in housing foundations) were effectively excluded from consideration. This narrowing of potential findings occurred before the remainder of RRC's decisions, made almost exclusively with Chevron representatives, further limited the ability of the RRC to appropriately characterize sporadic contamination entering resident lines after water main breaks.

By the time sampling efforts commenced, it was too late for residents to introduce protocols to investigate the validity of the above narratives. For example, the residents' consultants produced a map of their 50 foot grid, with bore hole locations over the NE pit (bisected by Murr Way and Lockgate Lane, the side of the bulk of the lupus cases). The map indicates that "liquid product," or crude oil, was found at 11302 Murr Way (at 8-10 feet), 11303 Murr Way (24 feet), 11315 Murr Way (10 and 26 feet), 11323 Murr Way (6-9 feet), 11322 Murr Way (5-8 feet), and 11323 Lockgate Lane (8-10 feet).²⁴⁴ During joint testing by RRC and Chevron, ETI workers asked a RRC official for permission to demonstrate where the liquid product was located, and were told that they lacked a work plan and had not submitted one in the requisite number of hours preceding their sampling activities on site.²⁴⁵ On December 13, 1995, RRC notes discuss this encounter:

“[Residents] want to spl (core soils) w/in and adj. to Chevron monitoring well @ 11323 MW. We have mtg. – Chevron say core rig disturb their well. I say we are implement Chevron plan and want to maintain interpret of Chevron data – but the next round of assessment we may address this.”²⁴⁶ Such an effort was not made, although RRC and later EPA agreed that “visible hydrocarbons” were present in some of the samples.

Site and Risk Assessment as a Negotiated Process between RRC and Chevron.

The Assistant Director of Site Remediation for the RRC described a typical day of sampling at the subdivision as follows:

Early in the morning, various parties, RRC, Chevron, Chevron’s contractors, residents’ representatives, and the residents’ contractors would meet for a safety meeting and go over the daily activities that would go on there. RRC would have at least one, sometimes 2 or 3 representatives on site to witness the activities and keep records and then the sampling plans would proceed...our role was primarily monitoring. Of course, there’s media attention and things like that. Occasionally we would have to answer questions like that.²⁴⁷

This image of parity in sampling and coordination across parties is not found throughout fifteen months of RRC correspondence documents, which focus primarily on media attention, RRC questions regarding cost and method, and, most importantly, the ongoing negotiation between Chevron and RRC over sampling protocol.

Media Attention. Most field notes taken on-site include the indication “no media attention” or “no media on-site.” Occasionally, media interest is noted, such as in a December 12, 1995 entry: “Chevron has staked locations for about 2/3 of the locations for soil samples and monitoring wells. High media interest. So far questions directed at Chevron and plaintiffs, not us.”²⁴⁸ In addition, there are entries that describe situations that could potentially spark media interest:

August 4, 1996: As of 8 a.m. this morning, everything is running smooth at KH. Patty reported that the picket signs that were used last week have now been placed on the curbs of the residential area. Between yesterday and this morning wells on the NW pit have been evacuated.²⁴⁹

The event most likely to encourage media involvement would be a finding of “explosive levels” of methane at Kennedy Heights. Most entries into RRC fieldnotes contain a notation that “no explosive levels” were found to date, usually on the same line as “no media attention.” RRC internal correspondence also outlines meetings with Chevron representatives and other discussions regarding what RRC planned to say to certain parties (including the media) should they be asked about the process:

December 8, 1995: Talked with Mickey Driver, Chevron public affairs rep in Houston this morning. They are putting out a media advisory today outlining what’s going to happen. Told Driver that my plan was to respond to media inquiries about RRC monitoring roles but to refer questions about the testing, sampling, analysis, etc. to him. He said that was fine...Driver is highlighting the methane aspect and sticking to the Chevron party lines that there’s no evidence anything else is there that poses a health risk.²⁵⁰

December 6, 1995: Kennedy Heights Technical Meeting notes. Noon on Monday. Any violence leave. Safety #1. Any questions about Chevron’s plan will be referred to Chevron. What to say: on top of situation, we are monitoring the situation, long as it takes, Chevron foot the bill not the taxpayers. Sample splitting priority: 1. Chevron, 2. Plaintiff, 3. RRC. Soil gas permeability we will not be involved in...Pick the worst looking samples for analysis.²⁵¹

August 25, 1995: Contacted by John Cambell, adjacent landowner, requesting information on the meeting with Chevron. I will provide the following information: Commission staff met with Chevron reps this Wednesday. The outcome of the meeting is that commission expects Chevron to submit a plan shortly within weeks or days which will include additional assessment activities as well as address safety concerns. If pressed for additional information I’ll take the stance that it would be premature to speculate until the proposed plan is received, if pressed further I will refer the caller to Office of Information Services.²⁵²

RRC Questions. As the RRC sought to manage perception of its involvement and determine what information it would share with various parties, it also tried to make sense of its role vis-à-vis Chevron and its contractors. There is never an entry in the RRC correspondence files regarding a request for information made by Chevron to RRC staff. On the other hand, RRC readily inquired into the feasibility or relative merits of methods and approaches throughout the site characterization process. RRC also struggled with severe resource constraints and sampling and analysis problems that arose with some frequency:

November 20, 1995: I finished reviewing the Chevron proposal on sample testing. The problem is I won't know anything about our lab capabilities till Carl Nelson gets back.²⁵³

November 29, 1995: Spoke with Carl Nelson and he said he was not equipped to handle any of the sample testing that Chevron is proposing to do. I am waiting on two companies to fax me their cost estimates. Core Lab is the only one to fax their cost estimate. Their cost is for just one sample for each of the individual tests - \$1,260.²⁵⁴

December 7, 1995: Authority to contract for equipment and materials necessary to analyze soil samples for methane gas and other contaminants from an unknown source associated with former crude oil storage pits. It is understood that the cost of this operation shall not exceed \$2,500.²⁵⁵

December 28, 1995: RRC soils, obtained two weeks ago when samples were split between Chevron, the plaintiffs, and the RRC, are being independently analyzed by Core Lab. Core Lab reported insufficient sample to run all tests on three of the four samples.²⁵⁶

January 17, 1996: Core Lab is experiencing problems and will ship the extract to the lab in Corpus. Samples affected are #13 and 14 – RRC tag 20946, 20947. 2-4 and 4-6 inch soil core sample. Analysis needed to complete work are TPH, semi-volatiles...Following questions will be addressed on the letter we will receive from Core Lab. The validity of the sample analysis. Integrity of sample being shipped back to Corpus Christi. Why were samples shipped to CC, then to Louisiana, and now back to CC?²⁵⁷

January 24, 1996: Ray will speak with Lloyd Deuel [at Chevron] and get his response on what effect the water is having on the integrity of the testing. Petty spoke with Chevron to make sure that the sample procedure that was changed (instead of pulling 6-5cc of volume with the syringe sample they are pulling 6-4cc of volume) is documented.²⁵⁸

February 20, 1996: I'd like to go over these KH test results [Chevron's methane investigation report]. I need to see the hotspots and understand what the report means.²⁵⁹

March 21, 1996: What is our next step at KH? Do we approve [Chevron's] plan, wait on [residents'] comments? Their recent letter still leaves open ended when RRC will receive additional information. Let's request a status update in 60 days.²⁶⁰

March 22, 1996: As of 10:00 a.m. we have received three bids. The low bidder is a hub – Chemsolve from Austin. Bid is for \$481 for either fluid or soil samples. The amount we are authorized will limit us to 5 samples. Bids have been signed and amounts double checked for accuracy. Any suggestions on what criteria we can document to award it as lowest and best bidder?²⁶¹

April 5, 1996: A review of analyses from various test samples indicates concentrations of organic compounds that may be due to laboratory contamination or the addition of the compound as internal standards. 1,2 Dichloroethane, Methylene chloride. Should take samples from same locations by equipment that has not been contaminated.²⁶²

May 9, 1996: Do you have a copy of the KH samples we sent out with the wrong address several months ago? I can't find mine. Please check with Carl Nelson on status of when current samples will be completed. I'm getting media and Commissioner requests for information.²⁶³

Lack of Balance in the RRC/Chevron Relationship. Resource and knowledge

constraints within the RRC left the RRC at a disadvantage as it tried to negotiate the

scope of Chevron's investigation. Chevron's initial Comprehensive Work Plan proposal contained several glaring omissions, according to RRC staff:

Why no evaluation of migratory pathways to residents and/or surface and subsurface waters? No toxicologic or risk assessment review of data. Need to evaluate presence and level of contaminants and risk to residents/environment. Work plan does not address high TPH soils, free crude oil in subsurface, crude oil contaminated groundwater, BTEX [benzene, toluene, ethylene, and xylene], PAH's, or other contaminants as required by RRC letter of November 13, 1995. Report calls for only one water sampling event in monitor wells, what about seasonal fluctuations and time? No permeability or hydraulic conductivity testing of samples, cores, pit bottoms. Why are Hollow Stem Auger pit samples shallow and only 8-10 feet, with no deep tests?²⁶⁴

Further meetings (exclusively with Chevron) led to an understanding that some of the above gaps in the site assessment process would simply be addressed at a later date:

"This is viewed as preliminary to help [Chevron] plan for a more detailed assessment activity which will culminate in a final report that will include a detailed risk assessment."²⁶⁵ But not all concerns were addressed, as evidenced by RRC's questions that remained following completion of the methane investigation:

April 8, 1996: Chevron still needs to explain several parts of the methane investigation, including origin of methane, why no methane maps submitted, if soils have low perm to gas, how does it diffuse through the soils, why so many "no vapor" tests and are they representative of a sampling technique problem, would a different sampling technique allow for higher concentrations, further evaluation of high levels of gas where Chevron reported them ...Further explanation of soil moisture affecting permeability and gas, is there seasonal variation, does that tie-in with "no vapor" reports?²⁶⁶

April 8, 1996: Chevron claimed in one of our early meetings that since the [residents] had already sampled extensively, Chevron wouldn't recreate those tests but would hit the high concentrations. However, [residents] are reporting additional sampling events with ever-higher concentrations in areas Chevron hasn't tested. Methane concentration distribution appears highly variable. Because of this, I think we need to be able to say all residences were evaluated. The only way to do this is a sample grid with a focus adjacent to homes.²⁶⁷

Sample grids were never employed at the Kennedy Heights site. This did not stop the RRC from claiming that findings of elevated PAH levels were "localized," despite the comparatively sporadic placement of soil borings that Chevron used.

Most of the other questions raised by the RRC were shared only with Chevron at frequent technical meetings. Residents and their representatives only commented on a

handful of occasions, usually immediately after the submission of a draft sampling plan. There is no evidence in the record of the kind of extensive interaction that RRC and Chevron shared in 1995 and 1996, when most of the physical sampling took place. Thus, not only were resident narratives regarding possible exposure pathways excluded from consideration by the broader sampling plans, but the minutia of daily site-based decision-making proceeded parallel but apart from resident involvement (with the exception of resident presence at the actual sampling locations). Far from serving as the lead stakeholder in a site investigation concerning matters within its jurisdiction, the RRC focused on taking a limited number of its own samples, managing media relations, and asking questions of Chevron contractors. Judging from RRC concerns that remained outstanding following the close of the methane investigation, some of these questions, such as whether to account for seasonal variations or the scattered location of soil gas pockets, were not even raised until near the close of the exercise. More importantly, residents were not made aware of the *ad hoc* choices made by RRC staff, such as equipment for use in sampling and their relative merits, where to send samples, what analytical methods should be used, how to split samples (visually, randomly, or by some other means), how Chevron would avoid violating the integrity of the samples, what the parties should do with diluted or questionable samples, and how RRC could serve its chosen role as monitor most effectively on a budget of \$2,500.

Residents Compare Ad Hoc Decisions to RRC Actions Elsewhere. The *ad hoc* nature of RRC's choices led residents to question the agency's involvement with the subdivision *compared to* its previous site interventions. On at least two occasions, RRC officials were asked to assemble data regarding site investigations at other former storage

pits in Texas. These included Memorial Glenn, which was adjacent to a residential subdivision (“Texaco had crude oil storage pits dating from the 1920’s with liquid crude exposed to the surface. No residents were involved. Remediation was a stabilization program where the pit contents were solidified on site”); Wilson Court, in Humble a few miles south of Memorial Glenn (“Numerous large crude oil storage pits dating from the 1920’s were partially backfilled on the 104 acre site. Liquid hydrocarbons were seeping to the ground surface. Current pilot program is a bioremediation/landfarm effort on 19 of the 104 acres”); and the Sun site (“four large and several smaller crude oil storage pits at the site again dating from the 1920’s...The pits were open and exposed to the surface. A bioremediation project is currently being conducted for closure.”).²⁶⁸ Information was gathered in response to requests from the media as well as State Senator Rodney Ellis’ office. Ellis’ Chief of Staff was most concerned about the “Texaco Humble Pits” and whether they were similar to the Kennedy Heights Site, as well as the length of time between discovery and sit closure. In reply, RRC maintained that

The age and use of the Humble pits are similar to KH, however many of the Humble pits were open at the surface and had not been backfilled. Residences were adjacent, not within, the pit boundaries. Elevated methane concentrations were not reported. Similar investigation activities were required, which included the installation of water monitor wells and extensive soil sampling.²⁶⁹

Comparisons of Kennedy Heights with other contaminated properties prepared by RRC do not provide more than a cursory sketch of the site differences. Some indicators that would suggest the need for swifter action at Kennedy Heights (e.g., pit adjacency rather than collocation with a subdivision leading to a stabilization program) are presented along with others that perhaps differed from the case at hand (e.g., hydrocarbons seeping to ground surface), although residents’ contractors would argue that similar conditions persisted at Kennedy Heights. RRC’s failure to adequately explain how it could engage

in varying degrees of remediation at nonresidential sites of former crude oil storage pits contributed to a souring of relations among the parties. Residents picketed some of the testing activities, claiming that RRC was responding at a slower pace to their concerns than to those at Memorial Glen. The narrowing of options as site assessment progressed, coupled with RRC's *ad hoc* decisionmaking and risk communications problems during sampling, encouraged residents to seek relief in the federal courts under the belief that they "will move faster than RRC."²⁷⁰

Risk Assessment – The Final Stage in a Negotiated Process. A final narrowing of resident options occurred through analysis of the disparate findings noted in Tables 3-5. By 1997, the only analytic work carried out with the sampling data was done by Compliance Solutions, Inc. (CSI) and transferred to the RRC through attorneys for Chevron.²⁷¹ The risk assessment concluded that "while weathered crude oil is present in some portions of the Subdivision, it does not present a significant risk to the health of the residents."²⁷² The risk assessment process did not consider the primary health outcome of concern to Kennedy Heights residents.

Risk assessment incorporates the best technical judgment of EPA scientists as to what toxic effect (cancer or non-cancer) occurs at the lowest dose for each chemical, since protecting against this most sensitive effect will afford protection against those toxic effects that are seen only at higher levels of exposure. In this regard, [the RRC] asked whether lupus erythematosus (an autoimmune disease) is considered as part of the Risk Assessment Report. Compliance Solutions has reviewed the published literature which indicates that lupus is not etiologically related to any of the chemicals of relevance to Kennedy Heights.²⁷³

Nor did CSI analyze samples of groundwater collected from soil borings as part of its formal risk assessment, "because of the lack of appropriate background and regulatory criteria."²⁷⁴

In addition, CSI made a number of assumptions in generating its risk calculations. First, "the quality of the analytical and field information was often unverified or the

required information was not provided to us for this risk analysis,”²⁷⁵ leading CSI to take existing reports and generate estimates of such variables as Method Detection Limits (the lowest levels of prevision above which a laboratory can detect the presence of a substance in a soil or water sample). For this calculation, CSI assumed that the ratio of MDL’s to quantitation limits (the lowest level at which a substance can be reliably measured by a given method performed by a laboratory) was constant for each toxicant, obtaining the latter from a Quality Control Study from Arthur D. Little and applied the numbers to Chevron data only (Phase 3 analytical results for select volatile organic compounds).²⁷⁶ CSI also assumed that all reported data were valid, “unless it was clear from available records that the technical problems associated with a specific sample made its inclusion impossible.”²⁷⁷ It assumed that the subdivision represented an urban rather than non-disturbed background, based on data collected by Fluor-Daniel-GTI for Chevron, and developed estimates of background for various chemicals accordingly.²⁷⁸ CSI then estimated 95% Upper Tolerance Limits for each chemical observed in background samples, but noted that “variations in the calculated 95% UTL’s were noted, and are believed attributable to small sample numbers and the relatively few locations sampled at depth.”²⁷⁹ Chevron’s statistician “considered 16 to be the minimum number [*sic*] samples necessary to develop background statistics,” but in order to achieve this number, CSI had to use Chevron’s “no vapor” samples (which residents noted were abandoned samples rather than true “non-detects”) to calculate its 95% UTL’s.²⁸⁰

CSI then determined how the data were distributed using the Kruskal-Wallis statistical test. The test compares the medians of samples from two or more groups, and answers whether all samples were taken from the same population. While the test does

not require a normal distribution in order to test its hypothesis, it does assume that measurements come from a continuous distribution.²⁸¹ We have seen that by all accounts, the distribution of soil vapors and certainly the sampling protocol at Kennedy Heights were discontinuous. In addition, the test, being nonparametric, does not allow for the calculation of confidence intervals, nor can it indicate by how much various measurements differ.²⁸² CSI dealt with the finding that background concentrations “showed marked skewness to the right” by taking the natural logarithm of each reported concentration, and generating the mean and standard deviation of the transformed data to calculate UTL’s for the site.²⁸³

The primary task of CSI was to compare data from samples that had been collected to their 95% UTL’s to “identify Potential Chemicals of Concern” (COC’s). As part of this comparison, CSI only labeled a chemical a COC if its geographic distribution was consistent with a potential source of contamination. On the basis of one or both of these criteria (numerical comparison and distribution), CSI did not identify any COC’s among the volatile organic compounds or semi-volatile organic compounds found at Kennedy Heights. This process can be compared with the TNRCC’s draft Ecological Risk Assessment guidance document, issued in November, 1996:

To evaluate the need for undertaking a response action, measured COC concentrations are compared to the lower of the human health Protective Concentration Level (PCL) or ecological PCL for each COC (the lower of the two is called the critical PCL). If measured COC concentrations exceed the critical PCL for any COC, the person may either refine the PCL’s by going to the next tier in the risk analysis or implement a remedy pursuant to the Texas Risk Reduction Program requirements. Response actions must conform to one of two options for performance standards, termed Remedy Standard A or Remedy Standard B. Under Remedy Standard A, affected media must be removed or decontaminated to permanently reduce COC concentrations below critical PCL’s. Under Remedy Standard B, removal, decontamination, or control measures may be applied to prevent exposure media exceeding critical PCL’s.²⁸⁴

Chapter 350 of the Texas Administrative Code states that PCL’s must be established for each COC in an environmental medium at a potential cleanup site unless a number of

criteria are met.²⁸⁵ None of the listed criteria apply to the Kennedy Heights property, meaning under regulations available in draft form in 1996, the lowest of three values (three different kinds of Protective Concentration Levels) for each chemical should be selected and compared with background levels to determine whether to proceed with soil assessment.²⁸⁶ Present regulations deviate from the kind of site-specific determination of background that Chevron conducted, and instead call for risk-based standards that are not based on the attainment of background (unless background is greater than the risk-based PCL or the chemical is listed as a Texas-specific soil background concentration).²⁸⁷ In any event, CSI did not compare its statistically-generated background levels to PCL's for each chemical, but rather to *soil sample data* offered by the parties, primarily from Chevron.

Following completion of the Baseline Risk Assessment, the only analytic application of the sampling data was carried out by the Environmental Protection Agency, which completed its work in May 2001. The report noted "there were Quality Assurance/Quality Control issues with previously collected data and therefore the EPA would collect its own data to be used in [its] investigation." This included mostly soil samples (62), as well as a few soil gas (13) and groundwater (9) samples, the latter utilizing Chevron's former monitoring wells. All samples were taken at 0-2 and 4-6 feet below the surface. The Inspection did not include drinking water samples, as a "review of City and State records indicate[d] that the drinking water supply in the Kennedy Heights neighborhood meets all drinking water standards."²⁸⁸ Traces of volatile organic compounds were found in soil samples, as were traces in groundwater samples. In addition, a "thin oily layer of non-aqueous phase liquid was encountered while taking

water level measurements at groundwater monitoring well NE-30.”²⁸⁹ EPA contractors documented hydrocarbon odors at several sampling locations when opening soil core barrels. Visible hydrocarbons were present in a monitoring well and in one of the soil samples. Still, EPA engaged in risk calculations only for soil as a possible exposure pathway.

The fact that almost all of the TPH occurs in soils at depths greater than 2 feet below ground indicates that direct exposure to soil at depth is not a complete pathway and the risk is reduced. The EPA also assumed a “worst case scenario” in which the highest concentration of TPH detected under Texas Methods 1005/1006 (1580mg/kg), was excavated and spread on the ground surface. A child playing in the dirt and coming in direct contact with the soil containing the TPH through the oral, dermal, and inhalation routes of exposure would yield a hazard quotient less than one.²⁹⁰

The Agency concluded that “the soils do not present a risk to the residents from exposure to TPH by direct contact with *soil*.”²⁹¹

The Limits Revisited and Applied to the Mediation Process

The above description of the Baseline Risk Assessment and Expanded Site Inspection only begins to delve into the assumptions driving the analysis, which effectively ended at the comparison of background to sample values. Still, it provides substantial documentation of the decisions made by Chevron and EPA contractors, relying to a considerable degree on best guesses and the use of proxy data. The process was sufficiently removed from those who would be affected by its results that residents chose to seek relief in the courts. Residents’ data gathering and analysis, designed to directly test resident narratives of contamination, were challenged by Chevron attorneys under the *Daubert* principles. For example, doubt was cast on the plaintiffs’ witnesses charged with generating a computer model and theorizing how toxicants were moved

from waterlines to residents' sinks and bathtubs.²⁹² Chevron questioned many of the assumptions underlying the model itself as well as plaintiffs' choice of inputs into the model.²⁹³ Chevron claimed that the model was not "scientifically valid" because (a) it was not initially designed to model oil contamination but was created for the modeling of soluble substances such as chlorine, (b) was not calibrated in response to field measurements, (c) eliminated portions of the water distribution system to increase amounts of the contamination to certain homes, (d) was run twice and then totaled, and (e) resulted in more PAHs at certain homes than had been entered under the assumed water line break.²⁹⁴ Defendants argued that much of the evidence regarding drinking water contamination was inadmissible under the doctrine set forth in *Daubert*. Before the federal district judge could rule on the admissibility of drinking water and other evidence, the case settle out of court, in part because plaintiffs wanted to avoid the possibility of a ruling on summary judgment.²⁹⁵

The kinds of limiting dynamics that grew out of the relationship between the RRC and Chevron as they carried out site and risk assessment set the stage for the mediation process that followed. As with the negotiated settlements described in Chapters 4 and 5, there were ample opportunities to create value and attend to some of the organizing themes that residents had translated into low-cost proposals (such as the replacement of pipes, water quality monitoring, and sampling approaches that accounted for resident stories of contamination). For example, under the Resource Conservation and Recovery Act (RCRA), plaintiffs claimed a right to require defendants to remediate the site, a process which their lead environmental engineering expert estimated at between 30 and 42 million dollars. Chevron ultimately offered 12 million dollars to settle the case, a sum

which represented their calculation of the expected value of their liability exposure should the case progress in court. For a fraction of these figures, resident interests could have been considered and addressed. Yet because the mediation process was based exclusively on data collected prior to when the court ordered the case to mediation,²⁹⁶ the site and risk assessment processes that were long underway by 1997 set both agenda and outcome of the process.

Mediation was ordered on September 22, 1997. Further, it was ordered that approximately 1,000 plaintiffs who had been previously severed from the case be rejoined with the other O'Quinn plaintiffs.²⁹⁷ At around the same time, a matter in state court that focused primarily on property value diminution was ordered into the same mediation.²⁹⁸ Several small, independent groups of plaintiffs were also folded into the talks. The court consolidated these actions in order to meet its objective of applying whatever was to be worked out in mediation to all claimants. The mediator (later appointed as special master) was asked to:

Make recommendations to the Court to define the final/complete plaintiff group in this case; and
Report to the Court and the parties his determination of an allocation of any of the settlement funds among the final/complete plaintiffs in the Kennedy Heights litigation.²⁹⁹

Thus commenced the settlement negotiations that plaintiffs had long prepared for (attorney notes suggest preparation of a settlement matrix linking plaintiffs to exposure years and forecasting bellwether claims settled in a certain dollar value range). The special master described "four phases" to settlement of the case on June 2, 1998, after having met with most or all of O'Quinn's clients (roughly 1,700 people):

The first phase, which I have explained extensively to the various clients and to the plaintiff attorneys, would be what I call a settlement model. The settlement model treats all of the parties fairly, even though each of the parties may get a different amount of the settlement. I should have the settlement model done within the next week, maybe as late as 10 days, to present to the

plaintiffs and their counsel. Once the settlement model has been agreed to by the plaintiff attorney, because it's essentially for their allocation of whatever amount the case settles for, I would then be involved in negotiating an actual settlement agreement. The settlement agreement will set out all of the detailed terms of the settlement. For example, the amount of plaintiffs that have to agree to the settlement and any other particular terms that may be unique to the settlement. Once the settlement agreement has been negotiated, Your Honor, we would then negotiate the dollar amount, the actual amount of settlement, and I will make clear to all of the parties and all of the attorneys that my view of the settlement has no bearing on liability of any. It is a settlement; it is a resolution of the dispute. Once we agree on the settlement amount, then the respective attorneys would send letters out with their signature and my signature to their clients recommending the settlement and the amount they would receive. As we did in the Fench Ltd. Case and the way I settled the Colonial Pipeline case, any of the clients who are not happy with the settlement then had a right to come and meet with me to review their settlement, and then I would make a recommendation to the Court whether their settlement should be raised or lowered or remain the same. The fourth phase would be for those clients who are just not happy with the settlement. The way we have handled it in the past is, after reviewing their claim, I have made a recommendation to the Court that their attorney, for example, O'Quinn should have the right to withdraw, and they would have the right to seek other counsel; and as long as the requisite number of plaintiffs agree to the settlement, then the settlement would go forward.³⁰⁰

All resident-plaintiffs met with the special master, for the most part on more than one occasion and in groups of roughly 20-30. Some recalled that these groups were divided according to geography. All sides agreed that the master discussed what he felt were the facts of the case and the case's merits with the residents. While certain residents were convinced by their meetings and by data made available to them that the neighborhood was only contaminated at "a minimal amount or level,"³⁰¹ others expressed concern over the master's apparent use of the meetings as a means of cajoling settlement by focusing on RRC/Chevron data in order to cast doubts over plaintiffs' chances at trial. Of equal concern to residents, particularly some who lived in the vicinity of the NE pit, was the manner in which their concerns were heard and then apparently discarded. For example, it was suggested that the master shared with the small groups a number of issues that would be considered during the process. One resident recounts these issues in a letter to U.S. Representative Sheila Jackson Lee:

My concerns with the case vary from the frequent presiding judges removed from the case to the apparent disregard of factors, such as the six elements. These elements were argued and discussed in trial and reiterated with residents in a meeting with the mediator as the basis to reach decision

on during mediation, per Judge Hittner's orders. The six elements included: (1) the buyout of homes over two of the three pits in the subdivision; (2) relocating residents; (3) transaction cost; (4) clean-up of area for other residents outside the pits; (5) move and replace water lines; (6) personal injury. The proposed settlement award for Kennedy Heights residents appears not to reflect the judge's request.³⁰²

Another discusses what he perceived to be the master's discussion of weaknesses in plaintiffs' case:

One of the things that came to my mind, the meeting that we did have with him. His thing was, OK, how many of you all here have ever heard of tort reform? And we were like. And then he said, now ya'll know that there has been tort reform that has taken place in Texas. So it's like, in other words, at this point here, because of tort reform, these particular categories here, you can just forget about these. And that's when one of us rose up a bit, and said "what are you talking about?" And he said all of the things that have happened to everybody. So the mediator's thing was, because of tort reform, you're not going to be able to get what you asked for. He had mentioned that Texas legislature had gotten involved in the whole process of tort reform, and everything, had turned everything around. So it was like he just found this out. He just found this out. And he said, since I know what I'm talking about, these categories here, you know, there's nothing that's going to really be done about all of these.³⁰³

Unfortunately, no records of the meetings were available for review, making it difficult to reconcile the various accounts of meetings with the special master. However, it is clear in court transcripts that by June, 1998, Mills claimed to have "explained to the O'Quinn clients that part of the settlement would not include a sale of their house, unless it was voluntarily by them to some third party."³⁰⁴ Even aspects of the "six elements" that would have required little expense and could have been accomplished without an admission of culpability (such as movement or replacement of water lines) were tabled by this point. To appreciate why a corporation would spend millions before addressing low-cost needs such as an elimination of resident uncertainty, monitoring, and relocation of pipes requires an understanding of what phase one of the mediation (construction of a settlement model) entailed.

The total dollar value determined and allocated as part of the final settlement of *Adams v. Chevron* was arrived at through the use of computer-generated settlement

models developed by the special master and his associates. Complete records of the final settlement or the development of the settlement model were either privileged or unavailable for review. However, it is clear that the model involved, at a minimum, two primary variables: “property” (a function of distance from the NE and SE pits) and “personal” (which was determined as a composite of duration of time spent in the subdivision, the monetary value of certain diseases suffered, and other considerations).³⁰⁵ Higher dollar values were computed for homes of varying distances from the NE pit, as it had been used for crude oil storage while the SE pit had stored brine. Property awards were determined for each address and divided among the number of plaintiffs who claimed to have lived at the address. The master made an effort to ensure that those living on top of the NE pit had sufficient resources to allow them to purchase a home elsewhere.³⁰⁶ Review of a map illustrating “Total Property Award” for plaintiffs in the *Adams* case shows that homes above the NE pit were awarded \$54,000.³⁰⁷ By comparison, homes over the SE pit were allocated \$15,000. The distribution of property awards appears uniform across the subdivision within a distance of 500 feet from the NE (\$25,000 when not directly over the pit) and SE pits (\$10,000 when not directly over the pit). At distances greater than 500 feet, the value appears as a continuous function of distance. The NW pit was not factored into the property determinations. Nor was the exposure pathway claimed by plaintiffs (ingestion, inhalation, or absorption of contaminated water through daily activities such as cooking and bathing) factored into the model.

The special master indicated that he reviewed hedonic pricing models, in addition to the site characterization and risk assessment data gathered by Chevron/RRC.

Residents were not confident that the final system of allocation based on the property variable yielded fair outcomes. For instance, there were reported disagreements over whether “median” or “mean” home values in Houston should be used (residents said that the master preferred to use median values, which they claimed resulted in lower housing value estimates). A broader concern was expressed over the fact that the “stigma” of living in a community that had been repeatedly labeled a “toxic waste dump” had reduced the value of *all* homes in Kennedy Heights substantially. Under this logic, a person living less than 1,000 feet from the center of a pit and receiving \$5,000 for property damages would not be able to afford equivalent housing elsewhere in the city.

Residents interviewed understood the “personal” variable even less. Review of a map showing personal awards to *Adams* plaintiffs reveals that this variable was not a function of distance. What is clear is that certain residents on Murr Way in the vicinity of the NE pit were offered personal awards far above the average settlement value (some in excess of \$50,000 and less than a handful above \$100,000).³⁰⁸ A source of much uncertainty following the release of the settlement amounts, the “personal” variable appears to have been built based on a system of “disease levels” developed by the special master and his team. One sheet lists plaintiffs, their diseases, and a monetary value attached to each disease (i.e., colon cancer victims appear to have been offered \$5,000 while those suffering from lupus were offered \$25,000). Multiple diseases received the sum of the value attached to each condition. The fact that residents were offered amounts that were not so evenly rounded (e.g., \$5,300, \$500, \$10,700) suggests that other factors, perhaps including time spent in the subdivision, were included in this variable. As one can imagine, the personal variable resulted in a wide variance of settlement offers, even

for people living on top of the NE or SE pit (for instance, three adjacent homes on Lockgate Lane received personal award offers of \$3,300, \$102,400, and \$6,200). To the present, residents who lack a clear understanding of the model or who feel that it was not fairly constructed are embittered by rumors of settlement offers received by their neighbors.

Plaintiffs' attorneys entered into a master settlement on July 28, 1999, which set a number of conditions that had to be satisfied by plaintiffs' counsel. Depending on where they resided and their representation, certain percentages of groups of plaintiffs had to elect to participate for the settlement to move forward.³⁰⁹ The maximum amount of funds to be paid by the Defendants was set at \$12 million (later raised to an aggregate amount of \$12.9 million), including \$4 million for plaintiffs' trial counsel for partial reimbursement of expenses and \$400,000 (later raised to \$650,000) for the special master.³¹⁰ Residents were given the opportunity to meet with the master and discuss any grievances that they had with the settlement. A total of 3,150 residents settled. An additional 589 did not. The court granted Chevron's motions for summary judgment and dismissed remaining plaintiffs' claims with prejudice on October 1, 2002.³¹¹ Log Development was also granted summary judgment based on limited immunity under the Texas Business Corporation Act, due to their bankruptcy and dissolution.³¹²

The settlement model described above was accepted by a sufficient number of residents because they lacked the ability to contest it, by performing jointly with the special master the kind of extensive soil sampling that would be needed to investigate resident narratives of contamination. Rather, the special master focused his attention on Chevron/RRC collected data and its interpretation through risk assessment to inform

what variables could be considered in a settlement model (such as distance from the center of certain pits instead of a more realistic measure of exposure). The mediator was clear about the applicability of Chevron/RRC data and its implications for the meeting of resident interests, relying on these data in order to determine that “there is no basis for this lawsuit.”

The sequencing of mediation phases locked in the translation of RRC/Chevron data used by the special master, who constructed a settlement model, had it approved by plaintiffs’ attorneys, added other conditions such as the proportion of claimants who would have to accept settlement for it to be agreed to by Chevron and the court, and *then* presented recommendations for individual settlement amounts to residents via letter. Residents sensed a disconnect between their involvement in 1-2 group meetings with the special master, where a broad range of topics were discussed, and their options following receipt of letters recommending settlement and disclosing their proposed awards. They were unable to explain how their expressed concerns over buyout of certain homes, relocation, clean-up efforts, replacement of water lines, and personal injury were either discarded early on or not included in the model. The model itself was not included in the mailing which recommended a settlement amount to each plaintiff. Those who wished to express their discontent were offered “the right to review” the settlement and, if necessary, the “right to seek other counsel,” having been deemed *pro se* after their attorneys withdrew from representation of their clients. Thus even if residents’ proposals factored into the final settlement model at all, they were unaware of how their ideas were incorporated. Model specification was relegated to a team of consultants and experts hired by the special master. The real negotiations, between government officials and

regulated entities through choice of sampling frames, model assumptions, and risk assessment parameters, had long been concluded.

Chapter 4

The Narrow Scope of Post-Accident Negotiation: The Unocal Catacarb Release

We woke up one morning, it was Labor Day weekend, 1994, and there was, we had a house that was on a hill, it's like the poor man's San Francisco. It's kind of like a town on the Mediterranean that comes up from the sea and all the houses are built terrace-like. And our house had a commanding view of the valleys and we faced, with the back of the house with huge banks of windows faced the refinery which was west. And we woke up and I looked at the windows and they were covered with a sap-like substance like from a pinetree and I went, oh, God, what did those kids do now? And then I thought well, what is this, is this from the trees? We had a lot of acacia trees around us that exuded kind of a sticky thing after they flower but it was the wrong time of year so I was really stumped. What was going on? And then I started getting a call from a gal who I worked with on the powerplant committee. She lived farther up the hill from me, and she was a real estate agent, and she had gotten a call from one of her clients saying, there's crap all over the cars, there's stuff all over the garden, the house, everything, up and down the streets, they were trying to sell their house at the time, and they were a little upset.³¹³

When I came back there were these brown, goopy spots all over my house, and windows that would not clean off. And so people started calling the health department for two days saying we've got this stuff everywhere and they said it might be pine pollen. They'd never come across anything like this before so they didn't know what it was. Finally, the company that was right next door to Unocal, at the time it was Wickland Oil, the manager called over and said we've got this crap just all over our units and people are getting sick, you've got this brown stain just trickling down the sides of the tanks. They were a little storage facility just on the East side of the refinery. If they hadn't spoken up I don't know what would have happened.³¹⁴

These are descriptions of the final two days of what was in fact a 16-day release of Catacarb, a catalyst used to strip sulfur from refined gasoline in the unicracker unit³¹⁵ of the Unocal Corporation's San Francisco Refinery.³¹⁶ A Unocal Material Safety Data Sheet describes Catacarb as follows:

Health hazards: Harmful if swallowed. Causes severe eye and skin irritation. Overexposure may cause damage to kidneys and liver. Avoid breathing vapor or mist. Liquid. Brown-black. Odor: None. Exposure guideline only available for diethanolamine (3 ppm OSHA, CalOSHA; .46 ppm ACGIH). Target organs include the central nervous system. Accidental release measures: Isolate danger area, immediate cleanup of any spill recommended. In California this is a non-RCRA hazardous waste due to the vanadium content. Diethanolamine is subject to SARA 313 and 40 CFR 372 reporting requirements.³¹⁷

Unfortunately, the above information comes from a document finalized in 1995. This information was not so neatly packaged in the late summer of 1994, when the refinery (located in Rodeo with prevailing winds moving in the direction of the town of Crockett) released over 100 tons of the solution.

A number of organizational contributors to the accident can be discerned from thousands of pages of witness depositions taken by one of several law offices to file a \$1 billion toxic tort claim on behalf of over 1,000 residents injured by the release.³¹⁸ They point to roles and routines that shaped refinery workers' decisions made during the accident, but were ultimately removed from consideration by the time the Contra Costa County Planning Commission conditioned future permit approval on Unocal's negotiating a "good neighbor agreement" with community representatives. What remained was a narrative of corporate greed and inordinate post-accident attention focused on community notification, both of which limited what was discussed, translated into proposals, and agreed to in the most groundbreaking community-corporate compact of its time. In addition to (a) the manner in which the accident unfolded, (b) parallel administrative actions, (c) efforts by Unocal during negotiations to limit changes to the status quo, and (d) technological limits during implementation further narrowed the set of interests represented.

The Unocal Catacarb release presents us with an "ideal case" for considering the limits to integrative bargaining following an industrial accident. Despite the disappearance of most of the evidence gathered during an investigation by the County District Attorney,³¹⁹ it remains the most documented petrochemical accident to lead to a written contract negotiated with an affected community. The negotiation process included representatives from each of four proximately located neighborhoods, and was carried out *apart from* existing legal proceedings, thus freeing it of procedural elements that could constrain agenda-setting, acceptable evidence, and the manner of communications among parties (a controlling factor discussed in Chapter 5). The

potential for residents to set agendas and priorities, develop proposals, tend to matters of cost and other barriers to proposal acceptance, and meet their primary interests through value creation, logrolling, and other strategies could not have been higher in this case, for several reasons.

The Catacarb release occurred while Unocal was seeking County approval for a land use permit for its reformulated fuels project, a draft Environmental Impact Report for which was issued in June, 1994.³²⁰ A series of public meetings following the accident, which began on September 13 (three weeks prior to a scheduled hearing before the County Planning Commission to certify the Final EIR), encouraged the County to condition permit approval on a good faith attempt by Unocal to negotiate resident concerns. On November 15, the Commission added the following condition of approval to Unocal's land use permit:

78. Within three months of the effective date of the land use permit and every three months thereafter, the applicant shall submit to the Zoning Administrator, for review and approval, a written report outlining the progress of negotiations of a Good Neighbor Agreement. Good faith negotiations toward a Good Neighbor Agreement, as determined by the Zoning Administrator, shall be a condition of approval of the land use permit. If the Zoning Administrator finds that the applicant has not facilitated good faith negotiations, the Zoning administrator shall notify the applicant of noncompliance with the conditions of approval and shall commence revocation proceedings for the land use permit.³²¹

The affected community's leverage over the refinery was further heightened by the growing tide of litigation, which encouraged Unocal to try to limit liability by working directly with a comparably small number of residents through direct negotiation.³²² It would also prove cost-effective to address certain concerns through a GNA, which included many long-range commitments that could be transferred along with general liability to the Tosco Corporation upon its purchase of the refinery in November 1996.³²³ An early community demand to develop an alternative dispute resolution process for claims related to the Catacarb release further enhanced the benefits

of negotiation perceived by Unocal. Unocal's relatively late start in pursuing permits for its reformulated fuels project also meant that it could not afford the kinds of delays that protracted litigation or administrative processes would require.

In addition, representatives of the affected area were well-organized and shared recent experience with community-corporate negotiation. Negotiations commenced after a final town meeting on October 5 and the Planning Commission's refusal to grant the land use permit on October 18. By then, Crockett leaders had organized the Crockett Group, composed of Douglas Tubb, Howard Adams, Kent Peterson, Alica Anderson, Kasha Kessler, and Dave Hicks. Some of these individuals had served on the Crockett Power Plant Committee, which opposed C&H Sugar's bid to construct a cogeneration unit for the world's second-largest sugar refinery.

So when we started hearing about how they were going to site this powerplant virtually across the street from some of our neighbors, we were appalled. We couldn't believe that it could happen. So I became involved that way more through, I was concerned with I had one child and I was pregnant at the time, and we were concerned about the chemical fallout. We were also concerned about the chemicals that they used in the process because they were using ammonia and it was going to be in a tank that was gonna be situated right on the curve of the railroad track. There were several items about the powerplant they were proposing that we thought were crazy to be putting so close to a neighborhood of 3,200 people... And then as I got into the process I was even more upset. Because it was even more reckless in the way that they were trying to put this thing up and the return to the community was practically nil. It was for C&H Sugar, and also PG&E liked it, because they were going to be sold the excess power. And the state of California liked it because it would be what they considered a co-generation plant, and therefore generating cleaner and less expensive energy. We didn't believe it and we proved it time and time again in front of all kinds of people.³²⁴

After ten years of opposition by the town and a citizen group called the Crockett Power Plant Committee, the applicants agreed to compensate Crockett residents for the effects of the new facility. Compensation came in the form of development of a portion of the Carquinez Strait for public access, various community improvements, and the establishment of a foundation.³²⁵ While the plant was only sited *near* the town of Crockett, the town received a share of the company's property tax payments. An

agreement between the companies, Contra Costa County, and Crockett ensured a stream of \$25 million in corporate donations and property taxes would be available to pay for community and public works projects.³²⁶ The Crockett Power Plant Committee secured the agreement after C&H received approval from the state Energy Commission for its building permit in April, 1993. Opposition was dropped as C&H went before the state Lands Commission in July, 1993.³²⁷

Following the Unocal accident, representatives of Crockett and Rodeo (including Lynn Cherry, Leonard Miglio, and Janet Callaghan) formed the Crockett-Rodeo Coalition. At a November 9 meeting at the Crockett Community Center, Crockett, Rodeo, and Bayo Vista residents developed committees and working groups and gave each committee tasks designed to clarify an initial list of community concerns generated at a strategy meeting held in late October. By November 13, the committees had formalized issues for negotiation within each of a number of broad categories of resident demands. They had access to a substantial degree of technical assistance from both across their neighborhoods (an expert in optics, a chemist, an arborist, prior petrochemical plant workers and union representatives) and from regional non-governmental organizations. Communities for a Better Environment, a non-profit environmental advocacy group composed of organizers, scientists, and attorneys, had become aware of the nexus between race and environmental quality through its research of the North Richmond, California community in the late 1980's. It offered significant experience in investigating and commenting on project impacts stemming from the Clean Fuels program at refineries throughout the region.³²⁸

These conditions allow us to explore the limits to integrative bargaining that exist even under conditions that are comparatively hospitable to such forms of engagement between parties. Despite the fact that the Unocal accident was a well-documented release affecting a highly organized and supported community operating under a County mandate, strict limits to what could be accomplished through negotiation emerged. To examine the forces that can narrow the expression of interests following an accident, I will search for institutional factors (roles, responsibilities, routines, rules) that were (a) paramount to preventing future accidents or refinery errors and not fully considered during negotiation or (b) present in such a way as to narrow the set of interests represented during negotiation or met during implementation, despite the use of integrative strategies known to be effective.

Catacarb Accident

Here is how the Catacarb release was understood by those in the local media and members of agencies charged with investigating the event: The accident began with a slow release of a “chemical mist” from the top of a 140-foot processing tower at 6:55 a.m., August 6, 1994.³²⁹ Media investigations uncovered an “initial flurry of concern” which led to the declaration of a refinery-wide emergency and notification of the County Health Department.³³⁰ Unocal workers started to shut down the tower, but the order to cease operations in the unit was countermanded by the refinery’s second-in-command. Hastily called meetings between supervisors and engineers (without the consultation of environmental and health and safety workers) yielded the conclusion that there was a “very slim” chance that the leaking tower would explode. Management decided to keep

the unit running until its next scheduled maintenance on October 8. County health officials were told that the emergency was under control. Meanwhile, refinery workers were noticing sticky brown spots on their cars and on equipment near the unicracker. Operator Diane Wang described the leak, which by early September was noticeable from nearby roadways, as a “giant troll and it was becoming monstrous.”³³¹ The unicracker chief repeatedly told his workers that “we can make it.” General Manager Stephen Plesh left for the Labor Day weekend with orders to keep the unit running. By September 4, workers began to notice Catacarb residue on the storage tanks of neighboring Wickland Oil. Residents started to complain to the company and to health officials.³³² Workers noticed a massive loss of Catacarb as they began to run out of potassium hydroxide. Then, Wickland Oil, located downwind of the refinery, notified Unocal that their property was covered in Catacarb and that their employees had been ordered to take shelter. The unit was shut down on September 6.³³³

The media accounts in particular focus on a decision (that in fact was never agreed to) made early in the two week cycle to run until a scheduled turnaround, a choice that was overwhelmed by a sudden cascade of events over the following Labor Day weekend. The “Catacarb incident,” as described by Unocal, also narrowly constructed the event to give the impression that the right parties were “contacted” and the proper data (post-accident monitoring, modeling, and sampling) “collected,” but offered few details of what transpired over the course of the two week accident. Table 6 shows the chronology of events according to refinery management:

Table 6. Unocal's Chronology of Events for the Catacarb Incident.³³⁴

Date	Time	Event
August 22	0650	Leak detected
	0720	Notified CCCHSD
September 4	0925	First complaint from Crockett
September 5	0120	Second complaint from Crockett
September 6	0815	Wickland called
	0910	BAAQMD notified
	0945	First visit to Wickland
	1000	Unit ordered shutdown
	1015	Hillcrest School contacted
	1030	John Swett School District notified
	1100	Unocal Medicine and Toxicology notified
	1100	Industrial Hygiene sampling
	1118	Notified CCCHSD
	1310	BAAQMD inspector visit
	1330	Second visit to Wickland
	1345	Visit to John Swett School District
	1400	Notified/Visited Bechtel
1415	Door-to-door notification of homes in Tormey	
1430	First cars washed	
September 7	0815	Unocal medical personnel contact Rodeo Medical Clinic
	1100	Environmental consultants arrive and begin sampling
	1300	Unocal visits Wickland to survey tanks, etc. for cleanup
	1345	CCCHSD request samples
	1400	Unocal medical personnel arrive at Wickland; interview employees (medical history), take samples
	1500	Wickland sampling
1615	Wickland recurring health complaints; certified industrial hygienist sent to Wickland	
September 8	0800/1300	Unocal medical visits Wickland
	1300	Biological sample collected
	1400	Unocal medical briefed Contra Costa County Health officer
	1600	Claims adjusters begin operations
September 9	0800/1300	Unocal medical visits operating units
September 10	1200/1600	Personal visits to community
September 11	0915/1500	Person visits to community complainants
	1030	Fruit samples taken
September 12	1000	Air modeling began
September 13	All day	Additional fruit samples taken
	1900	Crockett community meeting
September 16	0630	Community letter and update mailed

Following the accident, investigations focused on one explanation for Unocal officials' reluctance to tend to the leaking tower: the plant's safety record. In 1989, the refinery posted the longest safety record in the country: 6 million hours without a serious accident to cause anyone to miss work.³³⁵ Plant management, according to many agency

officials and residents whom I interviewed, operated under an incentive structure that included performance bonuses, which discouraged such simple procedures as routine equipment overhauls (the hydrogen processing tower's overhaul was delayed from February to October 1994).³³⁶ And refinery maintenance staff acknowledged that an early shutdown would cost nearly \$1 million.³³⁷ There is no denying the problems caused by a decision made at the refinery to extend its run cycle in order to maximize the life of the unicracker's catalyst and avoid downtime during the summer, when gasoline prices are rising.³³⁸ Yet the belief that this decision (fueled by corporate greed and condoned by monitoring agencies such as County Health Services, which either turned a blind eye or failed to detect an off-site release) accounted for the duration and severity of the release masks a complicated struggle that occurred throughout those two weeks in late summer 1994.

Underneath a broad and far from determinate incentive to continue operating existed a series of problematic practices that demanded attention should the company avoid "future Catacarb's," a phrase used often by local residents. The belief that refinery management decided to continue operation of unit D-409 until the next scheduled turnaround, while useful in pursuing criminal indictments of a handful of facility managers (which ultimately did not occur), severely limited agenda-setting for the negotiations that followed. Here we consider the seven areas of plant management and operations that were opened to brief scrutiny by the Catacarb release. An eighth area of practice, agency reporting and community warning, became the focus of much of the resources devoted to the Good Neighbor Agreement and its implementation.³³⁹

Confirmatory Decision-making. While an order given to continue operations until the next scheduled turnaround was never given, there was an initial “flurry of activity” on the first day of the leak as reported by the media. Table 7 (Appendix) shows the extent to which the leak was discussed formally on August 22 at meetings and informally through information sharing between two or more workers (of the reported 27 times workers in the sample attended meetings where the leak was discussed, 13 occurred on the first day of the release). The decision to continue operations despite the presence of a leak was made over the course of a single meeting early in the morning which “took less than one hour,” held in the office of Morgan Clark (General Superintendent of Operations) in order to determine whether “his hypothesis that we could run with a hole in the tower was correct.”³⁴⁰ The meeting, which brought together people that the Superintendent of Hydrotreating (Russell Crawford) believed would have an understanding of the unit, its history, and operations, relied on several bits of data to confirm Clark’s hypothesis. During this “review process,” many of the people involved were either vacation reliefs or stand-ins for permanently assigned employees, meaning the likelihood that they would “ask the right questions or know who to get the right answers from” was diminished (for example, the Chief of Metallurgical Engineering was out of town).³⁴¹ Being that it was not a regularly scheduled meeting, Clark and Crawford had the discretion to choose who should attend. This resulted in some glaring omissions: despite the observation that Catacarb, or a substance resembling this caustic material, had spread down the side of the tower, no effort was made to include an industrial hygienist, who would have represented the best storehouse of knowledge regarding air and human health monitoring options. Maintenance and health and safety personnel were absent from the meeting. Even though

an emergency had been called for the leak in the tower, an action which activates an emergency response system, the individual granted decision-making authority under this system (the Incident Commander, usually a fire chief), was not invited to the meeting.

Thus, Clark and Crawford met with Richard Ferneau (the unit's Process Foreman, who answered to Clark), and several engineers (i.e., corrosion, hydrotreating) to confirm Clark's hypothesis, offered to the group along with a set of options available to the unit: temporary shutdown, repair, and startup; shutdown leading to an early turnaround; or continued operations. Clarks' hypothesis led the group to seek to rule out immediate and catastrophic threats, the main concern of which was the "integrity of the tower." The stand-in for the Chief of Metallurgical Engineering, Vijay Malhotra, investigated the tower's integrity by reviewing the history of the tower, particularly an inspection of the D-409 during its last scheduled turnaround. His primary document of reference was the Turnaround Summary from 1992, found within a file for the tower (the refinery maintains a file for each vessel under pressure). The summary indicated that mechanical damage had been experienced by the tower, and Malhotra thought it "logical that the mechanical problem noticed during the last turnaround could extend, especially with the longer run."³⁴² A more important question for the immediate integrity of the tower was the source of mechanical damage. To answer this question, Malhotra relied on indirect evidence from the file (as a hole in a 140 foot tower leaking steam was difficult if not impossible to inspect while operating). The D-409 tower included a number of trays at various heights that held catalyst, separated by "vapor spaces." Although the workers present at the meeting could not be sure, it was assumed that the leak occurred next to a tray, which could have failed and rubbed against the side of the tower, causing or

exacerbating the hole. This assumption, along with an estimate that less than half the thickness of the tower's wall had been gouged in the previous 2.5 years, was used to conclude that such gradual erosion could not affect the tower's integrity. Several workers admitted post-accident that had they known that *corrosion* was the true cause of the leak, or that the leak was *not* directly across from a tray (the vibration of which was thought to have caused the hole in the tower), they would have recommended shutdown.³⁴³ Either fact (along with the knowledge that Catacarb was corrosive and included a corrosion inhibitor that could weaken as a run cycle was extended) would have pointed to an uncertain situation that should not be resolved through conjecture based on past history. "We wouldn't know what's going on inside" was the common description of the state of knowledge should either of the above facts be arrived at.

The meeting was set up to confirm the suggestion that the tower could run without risk of catastrophic failure, and so minimal evidence of mechanical integrity was accepted as sufficient. It is informative to consider the questions that were never asked during the meeting: How long could the hole (under steam pressure, which all interviewees believed would grow based on decades' worth of experience at petrochemical plants) increase in size before it *became* a threat to integrity? Could an acidic environment caused by CO₂ condensation have led to corrosion (acid attack and carbonate cracking were ruled out "because this vessel does not give us any history of any of those problems")?³⁴⁴ Could the solution in the tower be monitored for changes in normality (solution strength), the presence of iron (indicating rust), or other signs of corrosion or loss of Catacarb? Attention to avoiding "catastrophic" events led to a focus on confirming the absence of symptoms of threats to integrity or unit stability – the "hole

suddenly growing a lot bigger, something breaking away from the tower, or a big change in the process.”³⁴⁵ Absent these signs, and without any proof that large amounts of Catacarb were escaping the tower (based solely on visual inspections from various distances by some who attended the meeting),³⁴⁶ operations could continue. This decision was made in the presence of great uncertainty: besides the location of the leak relative to trays, there was disagreement over the Catacarb entry level in the tower and whether Catacarb would be removed by “demisters” (which separate liquids and solids from vapor) before exiting through the hole (it was later discovered that there was no demister before the hole). The confirmatory mode of decision-making meant that “common sense was ruled out,”³⁴⁷ meaning that a variety of counterfactuals were never taken to their logical conclusion once sufficient evidence backing Clark’s hypothesis was shared with the group.

Calls for refinery workers to reconfirm the hypothesis that the unit could remain operational despite a hole in its tower (which was strictly forbidden by the refinery’s Petroleum Safety Ordinances and viewed as a first for the refinery by all interviewed) persisted. On two occasions (September 2 and 4), small groups of refinery workers were called together to discuss the possibility of “online” repairs to the tower. Benchmarks for deciding when “off-line” (during temporary shutdown or shutdown leading to turnaround) repairs would be necessary were not requested. The fact that the emergency was called “under control” and subsequently “all clear” on the 23rd meant that there was no organized effort or mandate to look into such a question. In response to complaints on September 4 and 5 from Crockett residents, refinery management’s ability to frame questions so as to confirm the decision to operate was stretched to its limits. Crawford,

during a visit to the refinery on the 4th (he was on vacation but responded to word of a complaint), was asked by Clark to “verify that conditions at the refinery had not changed, to validate that there was no reason to change our course of action.”³⁴⁸ Similarly, Crawford (still on vacation) was asked on September 5 (after another complaint was received) whether there were any “substantial changes” from the day before. Finding no evidence that there had been drastic changes through calls with two workers (this masked wild fluctuations across several days prior to the 5th), he reported this information to the bulk shift supervisor and Clark. Any evidence to the contrary invariably lead to rival interpretations – brown staining on tanks at units downwind of the tower was explained away as “condensate,” “coke dust,” or residue from some of the tanks’ odor abatement systems. Complaints of brown film on residents’ cars were attributed to “pesticide spray,” “pollen,” or fallout from another area facility.

The need to interpret events so that they fit within management’s assertion that a tower could indeed run with a hole in it without posing a risk of catastrophic failure was used by a number of operators to cope with the diminishing possibility that their experiences with the unit would lead to the only rational, commonsensical conclusion: unit shutdown. It demonstrated that in the context of an accidental release, a small number of managers and engineers could construct the lens through which future observations, data gathering, and questioning would be filtered. And it pointed to a broader problem concerning how decisions made during an accident grew out of questions that limited the scope of data gathering or investigation. For instance, refinery manager Steven Plesh’s request that the emergency be declared “all clear” grew out of a single question: should the fire brigade remain on standby now that the threat of a

catastrophic occurrence has been ruled out?³⁴⁹ Answering this question allowed management to justify their contravention of refinery guidelines, which declare that an “all clear” should not be called until the potential hazards of a situation are “completely over and no longer a possibility.”³⁵⁰

Methods of Accident Investigation. After a decision to reduce rates in preparation for shutdown was reversed and the above meeting concluded, hydrotreating engineer Ellen Barker initiated a formal investigation of the leak by drafting a Management of Change (MOC) proposal. The need for an MOC was justified by the fact that the tower leak was “not a typical situation and operational changes outside of design should be reviewed.”³⁵¹ The MOC Work Request describes Barker’s justification for the investigation: “compliance with Unocal procedures” – it would in fact be the only opportunity to formally ensure that standard protocol for responding to an emergency, monitoring, mitigating, or repairing a leak, and related activities was followed.³⁵² Under an MOC, a review of available Material Safety Data Sheets (MSDS’s), a review by the Health, Safety and Emergency Response Department (not represented at the August 22 meeting), a structural integrity review, environmental review, and a Process Hazard Analysis (HAZOP), which considers a matrix of pressures, temperatures, flows, and concentrations under a variety of scenarios (relating to increases, decreases, and shutdown) would be carried out.³⁵³ The HAZOP team would have authority to recommend shutdown or repair. Instead, management determined on August 23 that an MOC was not necessary because “it was a change in operation, not something we installed to change operations.”³⁵⁴ In its place, a Process Review was commissioned, finding the operation stable and “everything in normal parameter ranges.”³⁵⁵ This review

was conducted from a strictly operational standpoint; no consideration of health or safety risks unrelated to the general running of the unit was given. The document further upheld management's confirmatory mode of decision-making, asking Ken Sadoian, a process engineer, to "endorse continued operation." The document "concurred that the hydrogen plant can be kept operating" as long as the operation of the unit "remains unaffected" and "no significant safety risk" was involved.³⁵⁶ It recommended that should the leak grow, these two criteria be used to determine if the unit could continue to operate.

Transfer of Organizational Memory. With the initial confirmation of plant operations in place (and influencing future investigations) and the only formal means of reviewing related procedures turned down, workers were left to share information on an *ad hoc* basis. Much was left uncertain by the above decisions: there was, for example, no Material Safety Data Sheet (MSDS) for Catacarb solution, only some of its constituents. There was no agreement among operators whether certain operating parameters signaled a loss of Catacarb along with the CO₂ and steam that formed a plume 140 feet above the ground. And as mentioned, differences of opinion were at the root of management's decision to operate (i.e., presence or absence of a demister, point of Catacarb entry, source of the leak, relative location of trays and vapor spaces). Not all operators, supervisors, and engineers were aware of the decision to monitor the leak (discussed below) or the results of the Process Review. They relied on the experiences of their coworkers with previous accidents and exposure to Catacarb, shared information regarding memoranda and studies that offered partial answers to operators' questions (such as the "Scherer memo," which suggested acceptable Catacarb parameters), made choices as to which piece of data to assign greater weight in guiding their actions, and at

times relied on unspoken agreement based on shared experience or training. For example, Steve Carroll (Superintendent of Maintenance) did not discuss concerns that the amount of Catacarb might be sufficient to cause health effects if the hole grew “because I thought it was well-understood by Morgan [Clark],” a judgment made based on Carroll’s prior work experience with him.³⁵⁷ Sometimes, the lack of communication grew out of a common set of expectations. Don Young, a shift supervisor, did not review an operator’s log because “if it was getting worse, [the operator] would have told me.”³⁵⁸ Intuition proved a poor predictor of behavior throughout the course of the release.

Many of the documented exchanges centered on major points of decision such as whether to continue operating on August 22 (49 exchanges), whether and why “all clear” should be called on August 23 (25), or how to respond to off-site complaints and stabilize the unit on September 4 and 5 (22 and 21, respectively). Two other clusters of exchanges occurred on August 24 (13, regarding whether to monitor and the risks of Catacarb overspray) and September 1-2 (18, regarding a failed transmitter on the side of the tower and its repair, observations of Catacarb on the Coking unit, and signs of unit instability). These exchanges occurred primarily among the individuals who had decided to continue operating or among members of a certain unit (operations, health and safety, engineering), with an occasional bridging of two units. The lack of purposive interaction across units failed to move the most valuable information to those with the discretion to shut down the unit, or reconcile conflicting understandings based on workers’ experiences. Operators, for instance, were assigned to different plant units to take readings and samples, their primary regular form of observation.³⁵⁹ They knew of certain dangers based on what they were required to wear when drawing samples, and the forms that they

had to fill out (describing the effects of Catacarb components) when disposing of Catacarb filters.³⁶⁰ Through these tasks, the knowledge that DEA, a Catacarb component, can degrade into a carcinogen was made available to at least one operator.³⁶¹ A bulk shift supervisor possessed an understanding of Catacarb, based on a leak in November 1992, which would have reconciled some of the inconsistent visual observations of the plume: He knew that Catacarb could coke around a leak, temporarily stopping it until steam blew off the crust that it formed around a hole in the tower.³⁶²

Experience with previous accidents was more commonly used to answer management's calls for evidence that operations could continue. Clark was present for an accident in 1990 where a control valve failed and a refinery unit lost all of its Catacarb, without any documented health consequences.³⁶³ He and others therefore discounted the health effects listed on MSDS's for individual Catacarb components.³⁶⁴ Knowledge of an incident in Chicago in 1984, where the failure of a process vessel resulted in the death of several operators, heightened attention given to structural integrity, while bits and pieces of information about the health effects of Catacarb remained lodged in the memories of plant workers who did not have an occasion to share what they knew.³⁶⁵

Visual Monitoring and Observation. The decision to operate the D-409 with a hole in its tower was conditioned on a system of observation designed by the process foreman, Richard Ferneau. Absent available channels through which organizational memory could be shared, reconciled, and used to inform decision-making, the observation log stood as the only means of communicating operator concerns with management. Operators were asked to record several key operating parameters (i.e., steam to carbon ratio, hydrogen production) as well as what they saw (i.e., the plume, any

other signs that the leak might be worsening). Table 8 shows the observations recorded throughout the release.

Table 8. Visual Observations Recorded During Catacarb Release.

Date	Comments
August 22	Blowing forcefully through insulation (3 pm); Some catacarb leaking to ground level (3 pm); No change (7 pm); Blowing through insulation. Little or no catacarb leakage. Refer to drips on ground from hole (11 pm)
August 23	No change (3 am); No change (7 am); No change! (3 pm); No change (7 pm); No change. Looking for size of hole to change (11 pm)
August 24	No change (3 am); ? Can't tell (8 am)
August 25	Blowing forcefully through insulation. Little or no catacarb leakage (3 am); Getting worse (8 am); Same (12 pm); Steadily worsening. No liquid dripping obviously but forceful steam plume (4 pm); Same (8 pm)
August 26	No change (12 am); No change (4 am); No change (8 am); No change (12 pm); Same (but catacarb visible in plume intermittently (4 pm); Same (perhaps odor is more detectable behind D-409). More spots on ground (8 pm)
August 27	Same as above (12 am); No change (4 am); Catacarb is starting to accumulate on lines and equipment (8 am); Same as above. Still accumulating on equipment, piping (12 pm); Continuing as noted above (4 pm); Continues (8 pm)
August 28	No change (12 am); No change (4 am); Still blowing catacarb . Catacarb probably coming down side of D-409 (8 am); Same (12 pm); It seems that the catacarb puffs have stopped with no new catacarb on ground (4 pm); No change (8 pm)
August 29	No change (12 am); No change (4 am); Still blowing catacarb (8 am); Same (12 pm); Slightly discolored cloud/plume blowing forcefully. Some wet spots at base (4 pm); Continuing as noted above (8 pm)
August 30	Slight increase (12 am); Same (4 am); No change (plume getting longer, spread out little further (8 am); No change (12 pm); Same (4 pm); Continues (8 pm)
August 31	Same (12 am); No change (4 am); No change (8 am); No change (12 pm); Continues (hole enlarged a bit) (4 pm); Continues (8 pm)
September 1	No change (12 am); Increased slightly (4 am); Same as above (8 am); Same as above (12 pm)
September 2	Same (12 am); No change (4 am); Plume increased slightly (8 am); Same as above (12 pm); Still blowing (4 pm); Still blowing (8 pm)
September 3	Blowing forcefully (12 am); Continues (4 am); No change (8 am); No change (12 pm); Catacarb on ground (4 pm); Still blowing catacarb on equipment behind tower (8 pm)
September 4	Maybe it's just sinuses on midnight shift but I started sneezing and watering when doing readings in area (12 am); Blowing forcefully, perhaps hole is enlarged (4 am); More catacarb on ground. Having to wash catacarb off ground (8 am); Same as above (12 pm); Same as above (4 pm); More noticeable catacarb on pipes and equipment . Very little steam in the cloud (8 pm)
September 5	Looks like vaporized catacarb . Hole looks bigger (12 am); Fire monitor on 407. Difficult to tell size of hole (4 am); Some puddles and gutters are brown . We must be knocking some down from mist (8 am); Leak still the same. Shut off fire hose per RM. Couldn't see catacarb on component (12 pm); With the increase in steam, catacarb coming from the leak is more noticeable (4 pm); Same (8 pm)
September 6	Blowing forcefully. Some operators complained got mist on windshields on way to work (12 am); Blowing forcefully (4 am)

Three aspects of the observations recorded by operators warrant discussion: descriptions of the plume, accounts of Catacarb deposition, and interpretation of either kind of log entry. The first mention of Catacarb entrained in the plume was made on August 26 (“Catacarb visible in plume intermittently”). As mentioned, a possible explanation for its sporadic appearance in the plume could be found in the tendency of Catacarb to coke around a leak until bits of solid Catacarb were blown free by the pressure behind them. Or perhaps there was a process explanation for why Catacarb might escape the tower irregularly. Absent either understanding, management and operators developed their own explanations. A head operator offered that “you take ten people outside and look at the same object and you’re going to get ten different answers. Someone wrote ‘blowing Catacarb’ and I asked him what he meant. We went outside and looked and looked, and then finally saw just a little puff.”³⁶⁶ Management tended to cite “atmospheric conditions,” “the angle that you look at it,” or “a trick of the light that made the plume look discolored at some points in time” as possible explanations for entries. There was also a lack of consistency in how observations were made and who recorded them. Some viewed the plume for length, some for velocity, and some for color.³⁶⁷ Various distances and angles were used when making observations (50-100 yards was not atypical). An example of an observation that was never recorded came on September 1, when Barker described the plume as “the worst I’d seen it” (the log does not reflect such a qualitative difference in the plume on the 1st). Barker intended to share her observation before an unplanned shutdown of a second stage change pump demanded her attention. Interestingly, such minor upsets could temporarily improve the appearance

of the plume. The latter upset resulted in rate cuts, meaning steam and any substances entrained in it would leave the tower in smaller amounts for a period of time.³⁶⁸

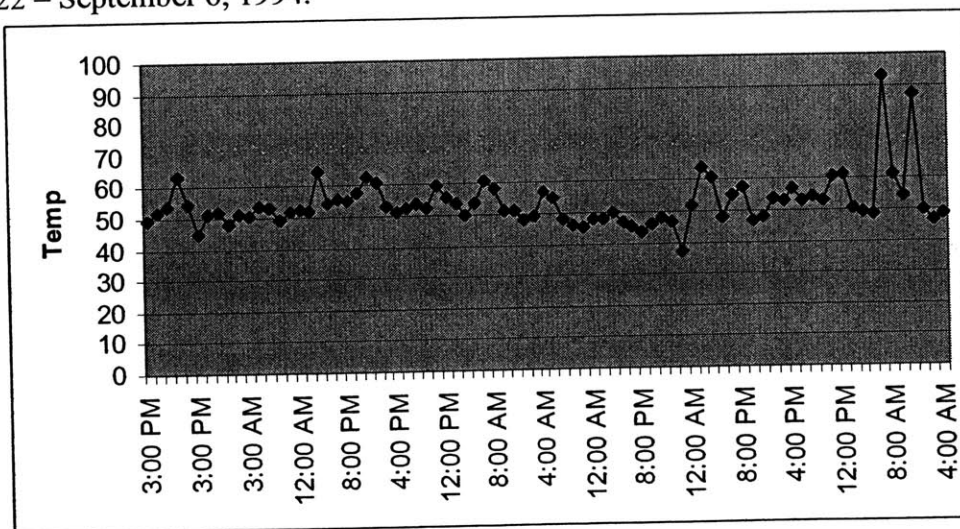
It would appear more difficult to form competing interpretations of observations of Catacarb *deposition*, noted for the first time on August 22 (“some Catacarb leaking to ground level”) and moving away from the immediate vicinity of the unit starting August 27 (“Catacarb is starting to accumulate on lines and equipment”). When management viewed Catacarb staining on tanks further up the hill from the unicracker, Crawford described staining on tanks as “new information,” with “nothing to compare to.”³⁶⁹ For one, management normally did not walk near where the tanks were located. Thus, the presence of brown liquid or droplets on equipment was interpreted as possibly dust, ash, dirt, condensate, material vented to atmosphere from vapor recovery systems on top of certain tanks, or general discoloration. There was no method in place to sample the deposition or make observations in a systematic way beyond the immediate area of the tower, making it difficult to record Catacarb’s steady movement toward the refinery fenceline. Efforts to “wash Catacarb off the ground” and aim a fire monitor at the plume to knock down what had become “vaporized Catacarb” on September 5 further confused observations and what they could be attributed to.

Management revealed after the accident that they intended the log to “make sure people were watching,” while they relied on their own observations. After awhile, copies of the log were no longer kept at the unit; they were sent to Ferneau and then to Crawford, meaning the full record of entries could not be reviewed for trends or sudden changes. Operators were never asked if their observations indicated Catacarb loss. There was great confusion over how an observation should be communicated or whether the log was

“given scrutiny or used to determine whether the tower would run.”³⁷⁰ Such circumstances were not conducive to building a case for shutdown, despite the consensus among operators by August 26 that the leak was “not just steam and CO2.”³⁷¹

Operating Parameters. The remainder of the observation log included entries for operating parameters that Ferneau believed would allow workers to monitor the stability of the unit (loss of Catacarb was at best a secondary consideration). The entries were to be recorded “so that we’d notice a trend and try to deal with it before a critical stage.”³⁷² Some of the variables could be linked to possible Catacarb loss. For example, the unit has a methanator, which converts leftover carbon and hydrogen in the stream into methane. A loss of Catacarb through the leak would increase the remaining CO2, which would increase “methanator delta” temperatures and possibly damage the system. Figure 5 shows the methanator delta temperatures during the release.

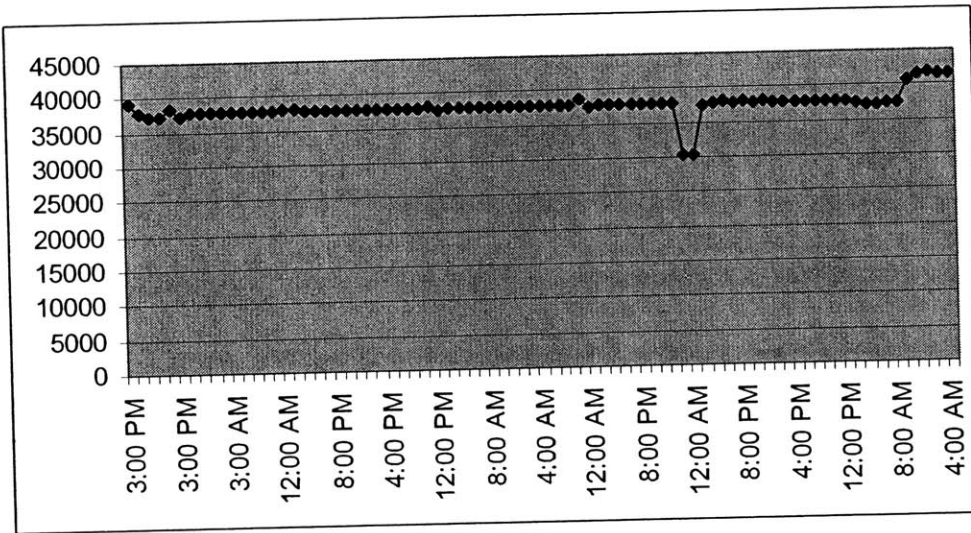
Figure 5. Methanator Delta Temperature Changes Recorded in Observation Log, August 22 – September 6, 1994.



These data suggest that substantial fluctuations began on September 1 and peaked over Labor Day weekend, when the temperature reading hit as high as 93.24. Upper

management (Plesh, Clark) was unaware of the values reached during this time. Engineers and the process foreman, on the other hand, were charged with telling operators “exactly what to add to the solution” to keep the unit running.³⁷³ The head operator, Milford Hodges, explained that during a time of unit instability, “it’s the wrong time to be asking why. Things are moving too fast and you have to stay on top of things. You run the unit; don’t let the unit run you.”³⁷⁴ This sentiment, shared by many of the operators, focused workers on the task of avoiding unit shutdown (extreme levels of instability can trigger automatic shutoff) and stabilizing parameters. For example, the feed gas gravity, another parameter listed on the observation log, represents the amount of hydrocarbon in gas that is reformed into hydrogen and carbon monoxide. The higher the gravity, the more steam the operator has to use to carry out the conversion. The more steam in the system, the higher the concentration of CO and therefore CO₂. If Catacarb cannot absorb the amount of CO₂ present, the CO₂ slips over to the methanator, causing a rise in that number. When operators found that they could not increase the feed gas gravity without the methanator “taking off” (signaling a possible weakening of the Catacarb solution because of its escape through the tower or degradation over time), they added KOH to make up for the Catacarb’s poor performance.³⁷⁵ Operators used the remaining eight feet of KOH stored on the unit on September 4-5, and put in an order for a new batch at the start of the week.³⁷⁶ Others responded to an increase in methanator delta by increasing the stripping steam in the D-409 (which helps with the CO₂ removal process). Figure 6 shows changes to the “steam to D-409” parameter.

Figure 6. Stripping Steam Readings During Catacarb Release, August 22 – September 6, 1994.



Two changes of note occurred during September 1-2 (when an unplanned shutdown elsewhere caused rates to go down) and September 5-6 (when attempts to regain control over the unit led to substantial increases). From Table 3, we see that the former coincided with a period when observations did not record the presence of Catacarb in the plume. The decision to increase stripping steam, so that operators could keep the unit from “running them,” exacerbated the amount of Catacarb released near the end of the accident (when residents awoke to “brown, goopy spots” covering their homes). None of the interviewees were able to estimate the additional quantity of Catacarb release caused by such an increase in stripping steam (and there was no way to measure at the time how much Catacarb was coming out of the leak in the tower as industrial hygiene monitoring had been ruled out).³⁷⁷ Nor was this their role during the release: as shown by other parameters on the observation log, the operators succeeded (with the above exceptions) in keeping unit indicators stable.

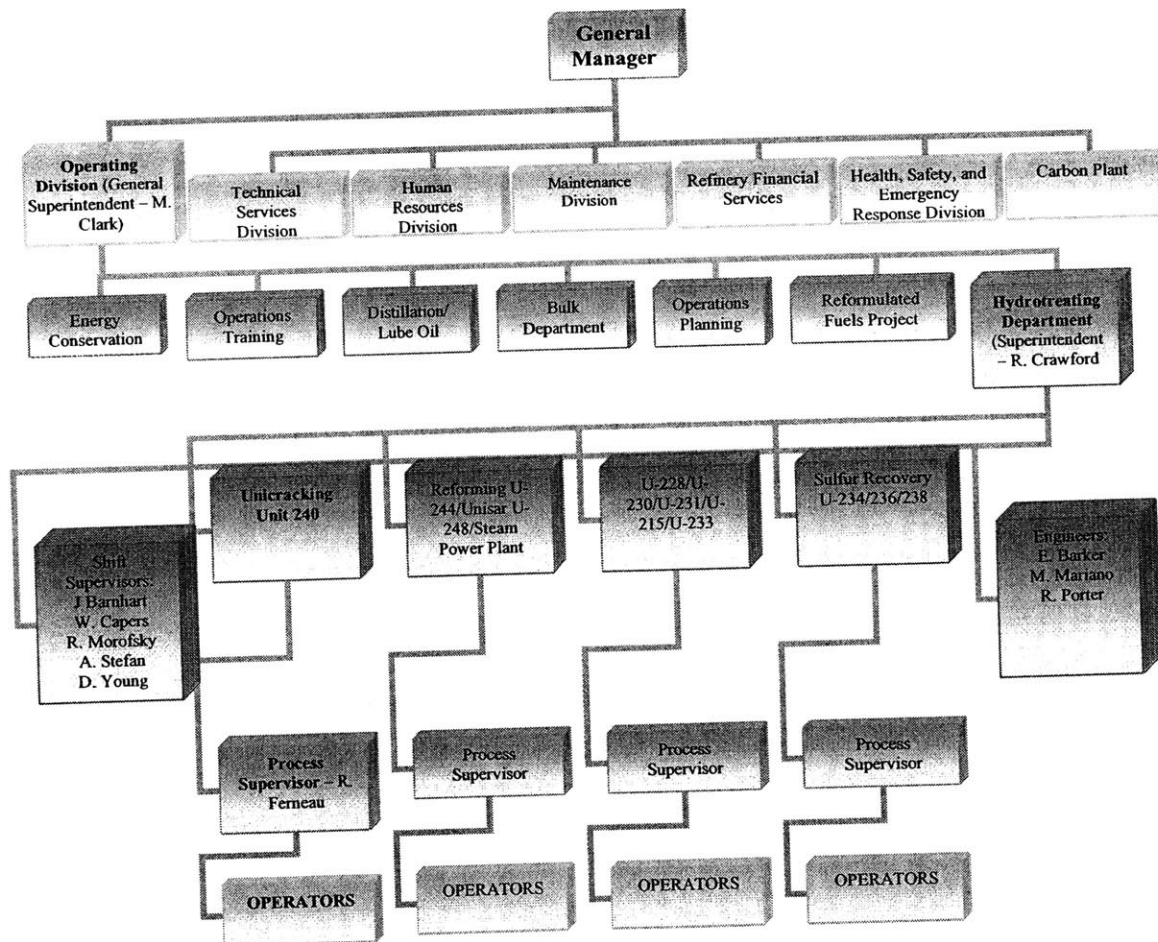
Because certain readings on the log, when they were available for trend analysis,³⁷⁸ did not *necessarily* point to Catacarb loss, the clearer objective to avoid catastrophic change prevailed. For example, a methanator rise could arguably suggest problems with catalyst in several other places within the broader hydrogen plant. A more certain indicator of Catacarb loss was the normality of Catacarb, or the concentration of active chemicals responsible for CO₂ absorption. At the time it was believed that normality should not fall below 4.5 due to the possibility of CO₂ breakthrough, or exceed 5.4 because of the corresponding increase in corrosivity.³⁷⁹ Normality readings were taken by a laboratory after samples were collected every Monday, Wednesday, and Friday (midnight shift).³⁸⁰ Again, not all unit workers (or members of management) were aware of the min-max values for Catacarb, or even the significance of the normality readings. When they did detect potentially troubling changes (e.g., normality readings of 4.32 on August 31 and 3.59 on September 2), engineers and management remained “of the mind that this was one sample,” leaving them to “question who took the sample and whether we gave them a representative sample.”³⁸¹ This, coupled with the time required to receive sampling results, meant that a meaningful trend of normality readings could not be established in time.

The increased visual and unit observations encouraged by the monitoring system DID detect changes in the leak, at times toward the start of the accident. But there was no mechanism for reconciling different interpretations, bringing together bits of organizational memory not shared among plant workers, or relating normality readings from samples, recorded operating parameters before they were sent to the process foreman and engineers, or visual readings of the plume and refinery grounds before

efforts to stabilize the unit led to temporary changes in unit conditions. A strong obstacle to bringing together these different bits of information was the hierarchical structure of Unocal and the limits that it placed on individuals' discretion.

Hierarchy and Emergency Response Authority. Figure 7 presents the San Francisco Refinery organizational structure as it related to the unit in question.

Figure 7. Unocal San Francisco Refinery Organization.



The first noticeable problem is the separation of Operations from Maintenance and Health and Safety. Concerns regarding a leak in the unicracking unit differed accordingly: the Operations division followed operating parameters, Health and Safety looked into safety concerns of the unit, and Maintenance focused on structural integrity

as well as “housekeeping” issues (such as the appearance of the unit as Catacarb deposition accumulated). By August 30, when Andrew Garcia, a member of the Health, Safety, and Emergency Response Division, told his supervisor that the leak had gotten worse, it had become acceptable to regard the situation as “Operations’ decision.”³⁸² Members of other departments were unaware of any procedures available for overriding decisions made either within the Operations Division or the facility as a whole (which would have proven useful to the external industrial hygienist).³⁸³ Nor were they given information regarding recent decisions made by other divisions, as when operators received no word of what was discussed or decided at a Health and Safety Committee meeting on August 29.³⁸⁴

Those within the Operations Division, particularly in the Hydrotreating Department, did not perceive an equal responsibility for decisions regarding the leak. A strong vertical chain of command existed in the department, which was self-reinforced by worker understandings of what would happen should, for instance, an operator “go around” it. Crossing the line between management and labor (operators), for instance, was referred to as “insubordination,” and going around the chain of command was viewed by operators as the first step toward being criminally prosecuted or even accused of sabotage.³⁸⁵ Workers with the most knowledge of the leak and its progression “kept opinions to themselves,” understanding that decisions were “not theirs to make” or that “their words carry little weight.”³⁸⁶ Contacting the hydrotreating or operations superintendent with a unit-specific concern was not common practice – only when clear safety concerns or an extreme unit upset leading to shutdown was evident was this viewed as acceptable practice.³⁸⁷ The usual chain of command was to report problems to

the head operator, who took his immediate instructions from the process foreman (Ferneau). The problem was, most of the refinery's management worked during one of four shifts at the plant (day shift). On the off-hours, it was left to shift supervisors to make decisions. With personnel and the precise delineation of authority constantly in flux, workers used deference as a means of avoiding decisions for which they could be held accountable: operators did not think their review of sample results was critical if a head operator was available to do the same, shift supervisors waited for the process supervisor or others with "more experience on the unit" to make decisions, the process supervisor, having been overruled on the first day of the leak after calling for a rate reduction, deferred to upper management, and the superintendents of the unit in turn believed that it was "the process supervisor [who] made decisions about operations." The act of reporting information became the only recourse viewed as appropriate by members of the Hydrotreating Department, and as we have seen, available channels for reporting changing conditions had their limits. Once information was reported, according to one of the shift supervisors, "they're [process foreman and above] aware of it and I'm aware of it, so there really isn't anything to talk about."³⁸⁸

With worker discretion held in check by refinery organization and an unwritten understanding of worker roles and their limits, the only aspect left to control was worker perception, absent a clear sense of the health impacts of Catacarb. The original Incident Commander for the leak had always worried about the "alarming factor" of the accident, stemming from the visual plume and its effects on local residents. As it turned out, this concern was first manifest among the operators. Workers experienced a "feeling of abandonment" as the leak progressed, to which the process supervisor attributed some of

the more alarming entries on the observation log. By August 25, requests for a “management presence” on the unit were made, and by the end of the month, the need for an official statement led the General Superintendent to begin drafting a memorandum for plant workers. The decentralized nature of information regarding the leak was evident in the memo’s construction, as members of the refinery from other divisions and units were asked to contribute bits and pieces to the document. Upon its issuance on September 2, workers were even more confused: the Catacarb constituent percentages (given in the memo by weight) appeared “off” to some, and the fact that “a comparable solution would be liquid clothes washing detergent” did not coincide with safety precautions taken during sampling and some operators’ past experiences with the caustic solution. What the memo did accomplish was to make the first official assertion that the leak “at its current condition does not present a health or safety risk...possibly the leak will grow in size, but mechanical integrity of the tower is not in question.”³⁸⁹ This declaration further reinforced many of the self-imposed and traditional barriers to vertical communication within the unit and the division. At times after September 2, the former Incident Commander (IC) had occasion to discuss sounding a new emergency, a decision not made because of the “Clark memo.”

None of these organizational barriers would have occurred had the refinery’s Incident Command System been upheld. Unfortunately, while the authority to call for unit shutdown could not be questioned once granted to the IC, *how to tell* if authority rested with the IC was in fact open to interpretation. The severity of an accident, information gathered upon the IC’s arrival, and the opinions of the “support group” (process foreman and above) could work alone or in tandem to determine the IC’s

decision-making authority.³⁹⁰ When workers referred to commonsense being “ruled out”

during the accident, they were often speaking of the work of the IC and his team:

In an emergency situation and you are responding to it, you go to the resources that are available. You would first get the unit personnel to find out the conditions of what is occurring and the conditions surrounding what is occurring to see what impact they might have. Based on that information we would then use either common sense to set some sort of “hot” and “warm” zone, quickly, then through monitoring and using the proper equipment based on the information that you have gathered, you would determine the true safeness of the zones that you established with immediate information, size of the leak, position of the leak, wind direction, and wind speed. Once you have established the parameters as far as monitoring, you might change that area a little bit.³⁹¹

When the IC and his team arrived on August 22, the “support group” had already decided to continue operations. A member of the team recalls that “a process was already beginning – there was nothing to be done, so we left.”³⁹² Once the leak was declared “under control,” there was no incentive for the IC team to learn more about the nature of the release, the “requirement for being there wasn’t as strong anymore,” and the process chief’s duty to provide the IC with technical information about the unit was reduced according to the refinery’s Emergency Response Manual.³⁹³ The following day, the emergency was declared “all clear,” effectively disbanding the IC team and reinstating the unwritten barriers to communication and decision-making.

Response to Off-site Complaints. Review of the timeline of worker actions during the release suggests a final area in need of refinement: response to outside complaints. Two complaints were received before the decision to shut down was made (September 4 and 5), in addition to two received by the Air Quality Management District (AQMD) on the 5th. Complaints were typically referred to the bulk shift supervisor because of his location on the perimeter of the refinery near tankage, pipelines, and other potential sources of offsite emissions.³⁹⁴ The protocol for receiving complaints was to “obtain as much information as the caller will give” regarding the odor, noise, smoke, or other

environmental concern, make an odor tour of the refinery (including fencelines) using a checkoff sheet, eliminate any sources if they are identified, complete a Community Hotline Call form, file the form in the Call Binder, and contact the Bulk Shift Supervisor to pick up the form.³⁹⁵ He in turn would determine the appropriate persons for handling the form and necessary follow-up calls, sending the form to each person. The first tour taken after a complaint was received on September 4 revealed stains further up the hill from the D-409 than they had ever been seen, darker on the side of equipment facing the leaking tower. The bulk shift supervisor was not confident in his authority to eliminate sources of offsite emissions should they be identified. On that and the following day, complaints were therefore referred to the general superintendent (Clark) and the hydrotreating superintendent (Crawford), both of whom were on vacation. The general manager and maintenance superintendent were indirectly notified, and an operator later learned of the complaint. On September 5, only Clark and Crawford were aware of a complaint following its receipt by the bulk shift supervisor (with the exception of the process foreman, who learned about it in the context of approving access to the tower for the placement of a jet stream from a fire monitor on the plume). On the first day, a visit to the address of the complainant that resulted in no personal contact was made by Crawford. The second day, no visit was made: Clark asked the bulk shift supervisor whether there was “anything unusual” at the refinery and was told that nothing had changed significantly from the 4th. Meanwhile, starting on the 4th, Clark, Crawford, and Ferneau worked on approving the use of a fire monitor to knock down as much of the plume as possible with water, a move that covered parts of the unit in brown liquid and affected the temperature of the boilers. This small group of managers had sole discretion

over the interpretation of the complaints and what to do about them. As evidenced by Crawford on his visit to the complainant's home, a member of management, untrained in incident response or the characteristics of certain chemicals used at the refinery, was unsuitable for the job of responding to resident concerns. There was no rule in place which stated that the true source of a complaint (such as "deposition of brown droplets on car") should be found before Unocal could deny responsibility. Nor was there any cooperation with County or AQMD officials in getting to the root of the problem. A single person visiting the refinery while on vacation, or another individual calling in from vacation, was the last line of defense against offsite consequences of the release.

Administrative Limits

The primary investigators of the Catacarb release were the Bay Area Air Quality Management District (AQMD) and the County District Attorney's office. While violations assessments were not issued until January 1995 (several weeks after a Good Neighbor Agreement in principle was signed with residents), a comparison of the manner in which agencies responded to the accident and the substance of community-corporate negotiation suggests an unwritten division of labor between citizen and agency enforcers of environmental regulations. Table 9 shows draft and final AQMD recommendations for corrective action at the refinery, as well as violations assessments for the Catacarb release.

Table 9. Summary of Violations and Suggested Corrective Actions Issued by AQMD.

Regulation	1/18/95	9/25/95	Description
1-301 – Public nuisance	Likely violation	Violation	Injury, nuisance, and annoyance were created for a considerable number of people as a result of emissions. Lab analysis of samples taken from Crockett property indicates vanadium content matching the Catacarb material. NOV issued for 9/5 and 9/6.
6-310 – Particulate Weight Limitations	Likely violation	Violation	Particulate emissions exceeded the general limitation of .15 gr/dscf (emissions were 32 gr/dscf)
6-311 – General Operations	Likely violation	Violation	Emissions exceed maximum particulate emission limit of 40 lbs/hr. (emissions were 278 lbs/hr.)
8-2-301 – Organic Compounds, Miscellaneous Operations	Likely violation	Violation	Emissions exceeded limit for emissions from a misc. operation of 15 lbs/day and 300 ppm total carbon (DEA emissions were 2030 lbs/day and 34,000 ppm). 48 count NOV issued for the above three regulations for 16 days (release period)
Suggested Corrective Actions, 1/18/95		Suggested Corrective Actions, 9/25/95	
1. Company safety culture must be changed so that Health and Safety Objectives are a top priority. Resources for safety objectives should be evaluated to the same extent that production objectives are emphasized.		Same. There must be Corporate level presence in Health, Safety and Environmental training.	
2. A plant error reduction program must be established to address human error in a systematic and scientific manner.		Same. Adequate environmental and health reviews should be done to provide management with accurate information.	
3. Move from a blame and punishment mentality to understanding underlying causes.		Not mentioned	
4. Create a culture in which workers feel empowered to participate, communicate freely in health and safety issues, provide feedback and ensure policies have real impact.		Same.	
5. Create a system to cope effectively when unusual events occur.		Same. As a minimum, an industrial hygienist should be on staff.	
6. Needs improved capability to assess health and safety problems.		Decision-making process must require greater involvement of competent environmental and health and safety personnel.	
7. Needs to establish an explicit policy of zero tolerance for leaks or releases of hazardous chemicals.		Same. Verification methods must be established that cover reporting, tracking, and progress reports with specific time deadlines.	
		Must have a more effective program to monitor and control corrosion.	
		Must have procedures to eliminate accidental emissions as soon as possible.	
		Health, Safety, and Emergency Response Dept. must be given evaluation authority.	
		Must develop MSDS sheets that represent chemical and petroleum mixtures	
		Should use the MOC or similar method to evaluate unusual situations	

In its Complaint for Civil Penalties, the AQMD focused exclusively on the above Rules and Regulations of the District, and sought the appropriate civil penalties.³⁹⁶ A Consent Decree arrived at between the parties included civil penalties at \$1.75 million plus costs of investigation, in addition to calls for (a) a trained industrial hygienist on staff at the refinery, (b) eight hours of training for each employee in the Health, Safety, and Emergency Response Department on responding to unpermitted hazardous materials releases, and (c) eight hours of training for five years for each of two individuals in the Environmental Affairs Department on compliance and reporting.³⁹⁷

Vague calls for changes to “safety culture” and the “blame mentality” were never codified into more precise directives for the company. Instead, the Consent Decree called for minor changes to existing training initiatives, plenty of which had been in effect prior to the release and worked fairly well, as evidenced by employees’ efforts to work to the fullest extent possible to address the accident within written and informal limits to their discretion. Indeed, suggested corrective actions sent mixed signals to the refinery, noting that “it is likely that given the preexisting conditions this type of release would have occurred no matter who the workers were” while at the same time calling for “a plant error reduction program” to address human error.³⁹⁸ Two easily reportable and verifiable actions, the placement of a hygienist and the completion of training hours, marked the only efforts to address organizational precursors to the Catacarb incident. In addition, several suggested corrective actions sought to ensure that the right information (MOC’s to evaluate unusual events, MSDS’s for mixtures, adequate environmental reviews, a system of corrosion monitoring) would be collected and that appropriately trained people would have evaluation authority. These recommendations failed to

acknowledge the extent to which needed information and a redundant system of control over shutdown decisions (Incident Command system and upper management) had been available during the two week release. They ignored the most troubling concern to emerge during the release, namely the fact that a heavily regulated, complex facility *encourages* employees at all levels to adopt routines (i.e., patterns of visual observation, information or knowledge transfer), rules (i.e., only ask questions or share information under certain circumstances), or means of framing questions (i.e., confirmatory decision-making) to simplify what is expected of them and their coworkers during an unexpected event. A hierarchical organizational structure helps to isolate these coping strategies within facility units or even individuals, making them difficult to identify, question, and correct. As refinery management conceded during the investigation, a system was put in place, clear signs that Catacarb was escaping in sizable quantities from the D-409 tower were captured and recorded, but appropriate response actions were not taken on many levels. Administrative actions after the release did not address these tendencies to simplify unusual circumstances and the ways in which they were magnified or hidden by the facility's organizational structure.

Negotiation Limits

A final corrective action suggested by AQMD was at the center of community-corporate negotiation: "Unocal must implement a policy that results in rapid notification of the BAAQMD for any future incidents."³⁹⁹ In a pre-negotiation strategy meeting held on 27 October 1994 for Crockett, Rodeo, CBE, and union representatives, a series of

resident concerns were generated, the most prominent of which was emergency response and notification

Table 10. Community Concerns Presented to Unocal.

Issue Area	Community Concerns
Response and Notification	Fenceline Monitoring; Community Advisory Panel; Independent Audits; Fire Department Training; Fire/Emergency Radio Channels; Data Base/Information Distribution Center; Community Warning System; Warning Sirens; Crockett-Carquinez Fire Department; Neighborhood Watch Network
Health	Health Risk Assessment; Bayo Vista Health Concerns; Funding for Health Services; Medical Monitoring; Health Care Provider Access; Fund for Medical Needs
Environment	Chlorine; Hydrogen Sulfide; Hydrocarbons; Wastewater Discharge and Disclosure; Emission Offsets; Worker Training; Flare/Noise Advance Warning; Tank Leak Monitoring
Financial	Long-term Financial Contributions; Fund Disbursal; Fund to Assist Community; Fund for Legal Assistance; Property Taxes
Transportation	Construction/Ongoing Traffic Mitigation; Parker Avenue; Anhydrous Ammonia; Cummings Skyway Funds; Bicycle/Pedestrian Walkway
Vegetation and Parks	Vegetation Buffer Zone; Bicycle and Walking Path; Lindsay Museum Donation
Safety	Relocate Hillcrest School; School Protection; Bayo Vista Safety
Vocational Training	John Swett High School; Apprenticeship Programs
Legal	Agreement to Negotiate; Conflict Resolution Process; Remedies for Breach of Contract; Refinery Name change; Drop Appeals of Reformulated Fuels Project Permit

At a November 9 meeting at the Crockett Community Center, Crockett, Rodeo, and Bayo Vista residents developed committees and working groups and gave each tasks designed to clarify the initial negotiating list. By November 13, the committees had made considerable progress.⁴⁰⁰ The Emergency Response and Community Warning Committee produced the following proposals in order to assist the refinery in avoiding future Catacarb-type incidents:

- On-site, paid professional monitors of community choice at all times
- Funding for community odor and spill patrol teams under the control of community groups
- Surveillance cameras at major refinery units, flares, and fencelines operated and monitored at all times by community and government representatives
- Citizen monitors inside the refinery that would participate in activation of public notification and warning systems during spills and releases

- Fenceline monitors directly wired to community fire departments and other agencies for immediate alerting of releases, designed to ensure early detection and control of release source; all data available to public
- Funding for fire departments to design and provide training for emergency response
- Workable evacuation plan practiced regularly
- Create and maintain compatible radio channels of fire/emergency units at Unocal with such units from County, Crockett, and Rodeo
- Computerized database with information on effects of known hazardous materials and recommended medical treatments
- Ensure rapid medical provision and agency employment of recommended procedures following release detection
- Fund operation of a community access public health and safety information distribution center serving communities
- Contribute remainder of \$250,000 previously committed to Community Warning System by Unocal
- Fund permanent installation and maintenance of warning systems
- Funding to enhance community-wide neighborhood watch programs⁴⁰¹

As evidenced by each of nine committees and their proposals, residents, many who were suffering from the effects of Catacarb exposure, spent much of their time crafting proposals and investigating alternatives.

We met endlessly. And we designed things because of course they were clueless. We called phone companies; we called places to find out what to do about some sort of calling system and also to get information from the County. For instance, one of the things we proposed was that they would mail to every person in Crockett every six months or a year or less, a postcard and ask them if they were chemically sensitive or if they wanted notification of what would be considered kind of a “level two” incident which is not the highest but kind of a middle incident. And we did this because my wife is very chemically sensitive and she has allergies and when they have a release, it affects her more than others and many other people felt the same way so we filled out all these forms and we figured out a way that Unocal could actually call with an automated system so that the County wouldn’t have to wait until doomsday, because they, literally people could be dying by the thousands and the County could say well, there doesn’t seem to be scientific evidence, and we’re not sure there’s any cause and we don’t know where the source of this is, even though of course there are now detectors all over the place, they still won’t commit to all of that. So we were going to have Unocal determine if it was their release, with these new infrared detectors to notify us if it was this kind of middle-range release.⁴⁰²

Such proposals, which sought to alter roles and responsibilities within the refinery, transfer some of the existing monitoring discretion from Unocal and agencies to local residents, and encourage the co-production of environmental safety by residents and the state, were either discounted or “chipped away” by Unocal negotiators.⁴⁰³ Tables 6 and 7 (Appendix B) show the initial GNA draft issued by Unocal on 9 December 1994 and all changes made to the GNA during single-text negotiations. From the initial text grew a

series of counterproposals, positional bargaining steps, and calls for further specification of provisions (105 in all), of which 33.3% were new program suggestions (by comparison, 40% were additional language/clarification, 11.4% were requests for additional money accepted by Unocal, 4.8% were requests for funding that were denied, 8.6% were requests that dates certain be added to existing provisions, and 1.9% concerned the addition of a party or working group to a provision). Less than half of the 35 new program suggestions were accepted by the refinery, including 1 emergency response (funding for a siren), 2 school safety (facilitate drills, add a bus turnaround), 3 environmental (send final fenceline monitoring design to the county, share monitoring data with the CAP, seek no offsets for emissions reductions), 2 transportation (begin transportation demand management program, reduce or reroute bulk deliveries), 2 vocational (hiring preferences, include maintenance work in the agreement), and 1 financial (shared tax allotment) and several legal provisions. Two interesting findings arise from inspection of the first draft and subsequent changes. First, the December 9 draft excludes the majority of issues for negotiation produced by the negotiating committees for issues of health risk and medical monitoring, emergency response and community warning, and environmental concerns. Many of the deleted items were attached to low-cost proposals, particularly in comparison to those issues that were included in the initial draft by Unocal (transportation infrastructure improvements, fenceline monitoring technology). Second, changes to the draft show that after December 12, before which some of the committees' issues were reasserted by the community and rejected a second time, negotiation focused on additional financial resources for the two primary towns and provisions included in Unocal's first draft, further specification of

procedures and standards of implementation, and the addition of dates certain and a process for resolving disputes over interpretation of the accomplishment of said procedures. The degree of inventiveness and willingness to experiment with new solutions was greatly diminished by the time residents were called upon to respond to Unocal's initial draft.

Importantly, there was more give and take away from the negotiating table. Unocal's concessions in other venues dwarfed (and were often echoed in) the provisions that were added to its single text GNA. Before issuance of the single text agreement, Unocal made a series of proposals that were mostly offered directly to the County's Community Development Department or its Board of Supervisors, or agreed to with the Rodeo Municipal Advisory Council (RMAC), a quasi-governmental body whose members were appointed by the Board of Supervisors:

September 21, 1994: Memorandum of Understanding with RMAC⁴⁰⁴

- Locate Tank 109 further from Hillcrest School
- Improve emergency notification plan to Hillcrest and St. Patrick's Schools and Bayo Vista
- Provide Rodeo with quarterly newsletters information community of project status
- Conduct two shelter in place workshops and distribute kits by June 1995
- Work with Rodeo licensed day care centers to request notification from Community Warning System; provide for any required access material and installation
- Continue participation in the Refinery/Petrochemical mutual aid system
- Appear before the RMAC quarterly during project construction
- Contribute \$50,000 in January 1995 and \$50,000 in January 1996 for community improvements in Rodeo, selected by RMAC
- Advise RMAC of future hiring plans
- Work with Contra Costa building trades to implement hiring outreach for apprentices from Crockett, Rodeo
- Work with County to develop a community advisory program
- Work with East Bay Regional Park District and State Lands Commission to develop bike and walking path along San Pablo Avenue
- Contribute \$25,000 per year for three years to John Swett Unified School District for specific student programs
- Contribute \$378,000 for facilities improvement project at Hillcrest Elementary School

October 12, 1994: Activities Summarized to Community Development Department⁴⁰⁵

- Reviewing notification procedures with regulatory agencies
- Will continue to work in conjunction with County's expanded emergency notification network

- Forming a Community Advisory Panel with representatives from Crockett, Rodeo, and Tormey
- About to begin educational program with schools, senior centers, day care facilities, and community groups on how to respond to emergency releases
- Making a contribution to Hillcrest (agreed to with RMAC)

October 28, 1994: Activities Summarized to Community Development Department⁴⁰⁶

- Is investigating all property damage claims; efforts to clean cars, windows, and personal property will be completed soon
- Contribution has been presented to Hillcrest (October 20)
- Will install temporary on-site monitor at Hillcrest this week to allow school to be aware of airborne release
- Working with Community Awareness and Emergency Response (CAER) organization to educate community on sheltering in place and other ways of protecting themselves in the event of a release; developing videos to be mailed to each neighboring household
- Signed contract with CAER for installation of new community warning system, scheduled for completion in December 1995; would be capable of linking directly to all major local TV, radio, and cable stations, activating sirens audible to residents within one mile of each major industrial facility in County, including Unocal, initiating the current Community Alert Network, a computerized telephone system which delivers messages to businesses and residents during an emergency, and connecting to digital highway signs planned by State Department of Transportation.

November 8, 1994: Letter to Board of Supervisors⁴⁰⁷

- Opened a temporary medical clinic in Crockett staffed by independent medical expert specializing in toxicology and environmental medicine
- Initiated a health risk assessment working group including representatives from the community and risk assessment experts selected by the community and Unocal

November 8, 1994: Unocal presents its Response to Community Concerns⁴⁰⁸

- Will work to form a CAP, the function and role of which will be defined in a separate agreement
- Will provide status reports on the project to the CAP
- Will request that land use permit conditions apply to Crockett as well as Rodeo Fire Department emergency response
- Will work with Community Awareness and Emergency Response organization to implement a new Community Warning System; has committed \$250,000 toward implementation of the system
- Will implement shelter-in-place education plan including two workshops and distribution of videos to 6,000 residents
- Will provide quarterly newsletters on project
- Will continue participation in Refinery/Petrochemical mutual aid system
- Will work with CAP to enhance emergency notification procedures
- Will continue to upgrade internal communications systems, including purchasing cellular phones, pagers, and other equipment
- Will develop system to provide timely notification to emergency rooms, health care providers, and pharmacies in the event of a release
- Will install experimental remote sensor fence-line monitor pilot program at refinery
- Will prepare report on pilot program and share with CAP and community groups
- Will install a set number of bellows valves on project facilities or by replacement of existing valves prior to March 1, 1996. Will replace other existing valves by 1998
- Will preferentially purchase local emission offsets
- Will install a permanent air monitoring device at Hillcrest School by end of November
- Will phase out anhydrous ammonia at refinery (replaced with aqueous ammonia)

- Will conduct human health risk assessment through a working group; will present results to include monitoring data and conclusions
- Will continue to have medical expert specializing in toxicology and environmental medicine available to residents to address health concerns related to recent releases
- Will agree to annual contributions to Rodeo and Crockett for general improvements
- Will work with Supervisors to develop a means of allowing Unocal to participate in partial funding of Cummings Skyway extension
- Has donated \$378,000 to Hillcrest School
- Will work with East Bay Regional Park District and State Lands Commission to develop a bike and walking path along San Pablo Avenue through refinery
- Will advise CAP of future hiring programs
- Will work with building trades to implement a hiring outreach program for apprentices
- Will contribute \$25,000 per year for three years to John Swett Unified School District
- Will develop an alternative dispute resolution process for claims related to Catacarb release

These concessions indicate that the refinery was active shortly after the Catacarb release, seeking to influence public and quasi-public bodies with changes affecting primarily the elementary school system, resident notification, and emergency preparedness. By the time the facility made its first official response to resident demands, new refinery management had generated their own set of emergency response proposals, such as a system to provide timely notification to emergency rooms and pharmacies. Yet it is striking how the set of organizational practices and cultural conditions discussed in this chapter, some of which were known to a broad cross-section of workers and AQMD and County investigators (as evidenced in dozens of interviews conducted after the release), remained “black boxed” during the negotiation phase. With the exception of AQMD’s calls for training, the presence of experts in certain parts of the facility, error reduction, and broad attitudinal shifts, the only vehicle with the potential to introduce change *within* the refinery after the Catacarb spill was technology. Resident proposals to deal with what they believed had exacerbated the accident’s effects were based heavily on technological fixes.

Technology, in the form of a proposed fence-line monitoring system, held this distinction because of the lack of time and proper representation of each level of refinery

organization during GNA negotiations (part of this was due to the fact that upper management was placed on paid leave following the accident and the internal investigation was relegated to the Legal Department). Joint exploration of refinery practices *after* reaching a GNA was also a distant possibility, as only 0.3% of Unocal’s financial commitments were allocated to a one-time independent safety audit. By comparison, fenceline monitoring, which could alter relationships between refinery personnel, residents, and county enforcement officials, correct information asymmetries during unusual operating circumstances, and render Unocal’s past reporting hesitations a moot point (emissions crossing the refinery fenceline would be known to a broader set of publics in real time), assumed nearly 17% of the funding outlays. Residents, with the help of CBE, worked to include this technology as a condition of approval (condition 76) for Unocal’s land use permit. A resident explains how such a condition was added to the Planning Commission’s permit approval:

We shared documents, draft documents for instance. We had a draft of the GNA that we gave to the Commission and asked them to put specific language into the permit from our document, to legalize under the permit things that we were getting Unocal to agree with. In some cases they did that, took language even verbatim. In other cases, they did not. But there was a parallel process and it worked to our advantage.⁴⁰⁹

Condition 76 was the closest that the resident committee charged with preventing “future Catacarb’s” could come to encouraging changes within the refinery. A different set of priorities emerged from proposals from other committees, which at times were also tied to permit approval:⁴¹⁰

Transportation improvements:	\$4,530,000 (30.3%)*
Financial contributions to four nearby communities:	3,000,000 (20.1%)++
Fenceline monitoring:	2,500,000 (16.7%)*
John Swett vocational training:	1,500,000 (10.0%)++
Anhydrous ammonia phase-out:	1,000,000 (6.7%)*
Tree planting:	670,000 (4.5%)+
Hillcrest school improvements:	590,000 (3.9%)+
Health risk/epidemiological study:	488,000 (3.3%)
Reduce emissions:	300,000 (2.0%)*

Medical clinic (for Catacarb victims):	120,000 (0.8%)
Bike path:	100,000 (0.7%)*
Emergency preparedness/community warning:	90,000 (0.6%)+
Safety audit:	50,000 (0.3%)
Miscellaneous:	10,000 (0.1%)

* = condition of permit approval

++ = substantial improvement over permit condition

+ = improvement over permit condition

Positional bargaining tactics, such as the anchoring of proposals on permit conditions, early concessions made by Unocal which met the interests of external parties, the tabling of certain proposals by the company, and the early introduction of a single text GNA, limited the amount of integrative negotiation that took place, particularly after December 9. But opportunities for exploiting common interests or differences between the parties were clearly present. As mentioned, residents spent much of their time in October and November 1994 crafting proposals that took advantage of the parties' different capabilities. The primary difference to become the focus of many of the proposals concerned Unocal's limits in detecting emissions beyond its fenceline and in notifying sensitive populations. On-site community monitors, odor and spill patrol teams, surveillance cameras linked to web pages, community monitors inside the refinery that would participate in the activation of public notification and warning systems during releases, wiring of fenceline monitors to agencies and residents' homes, and community-wide neighborhood watch programs were each designed to augment existing facility systems of emergency response with broad-based community awareness and involvement, so that "future Catacarbs," particularly their duration and escalation, could be avoided.⁴¹¹ There was also discussion of some of the materials used in refinery operations as well as loss of valuable compounds through fugitive emissions. Finally, community funding was broached by refinery management with an offer to take advantage of the parties' different

views of future events. Unocal proposed that the “crack spread,” which captures the relationship between crude oil and gasoline prices (thus determining profit), be used to determine financial contributions. They offered to agree to a minimum amount of money and to agree to a base level crack spread. The amount of Unocal’s financial contribution would increase should the crack spread increase by a certain amount.⁴¹²

Two other areas with the potential to yield integrative solutions were parties’ comparative values placed on various interests and their criteria for success. Unfortunately, the manner of group problem solving removed much of the opportunity for systematically comparing interests, determining priorities, and thinking about workable tradeoffs. Review of the minutes to Unocal’s meetings with the community’s Negotiating Committee show that between November 3 and 28, discussions were dominated by refinery manager Allen Randle, who reiterated existing and planned facility changes and programs. A second line of discussion during this time period focused on efforts to commit Unocal to a binding legal agreement to negotiate residents’ concerns to conclusion. Residents suggested this agreement as a means of facilitating permit approval while the community ironed out its disagreements with Unocal and produced a final single text agreement. By the time such an agreement was finalized (November 28), a schedule had been established to consider the issues of 2-3 committees per meeting. The Negotiating Committee was not made aware of the nuances of each committee’s proposals until their representatives appeared at their scheduled meeting. Committees also met independently with Unocal, where tradeoffs, deletions, and new ideas emerged in a context removed from the broader agreement. Criteria for success were similarly removed from discussions between the Negotiating Committee and Unocal. Parties

agreed to consider such benchmarks *after* a good neighbor in principal was approved by all and the reformulated fuels permit was issued.

Group decision-making effects stemmed for the most part from the committee structure set up by the Crockett-Rodeo Coalition. The committee structure had a number of effects on the GNA negotiations. First, it solidified a number of important issue areas that had been initially presented to Unocal *en masse*. By allowing small groups of highly dedicated and qualified people (for instance, the health committee included a chemistry Ph.D.; the vegetation and parks committee included an arborist) to further explore these issues, the committee structure made it more difficult for Unocal to ignore or postpone consideration of certain proposals. Interviewees credit the committees for ensuring that a number of their initial demands were accounted for in the final agreement, even though residents, who in some cases had just completed ten years' worth of negotiations with other companies, gradually dropped out of the process. Committees also met on separate occasions with Unocal, allowing for more focused discussions, and reported back to the broader negotiating committee, chaired jointly by Crockett and Rodeo residents. At the same time, the committees did provide their own set of challenges. Representation on the committees was inherently lopsided due to self-selection. This meant that after mid-November 1994, access to decision-making and the ability of certain affected areas to influence policy was limited. As shown below, the committees, by virtue of self-selection, did not encourage equal consideration of the issues by representatives of each community. Finally, the presence of committees, and their direct negotiations with Unocal, constituted an implicit concession on the part of the community that there was a limit to which any particular issue could be addressed without crowding out the interests

of other committees. For example, certain committees were adamant that demands for school relocation be dropped so as not to affect other concerns. Similarly, efforts to commit Unocal to fund all or part of the Cummings Skyway road extension were viewed by some as a misuse of money that should have been appropriated for school relocation or other projects.⁴¹³

Another limit to integrative bargaining included a high degree of valence or degree of acceptability of solutions revealed early in the series of GNA meetings, heavily concentrated around Unocal initiatives, restatements of existing commitments, or (to a lesser extent) Crockett-Rodeo Coalition demands. The smaller Bayo Vista housing authority and the town of Torrey, as well as citizens that had not become involved in committees by early November, were thus left with less available room for having their proposals heard and included. The GNA signed on December 20 does not include any improvements for Bayo Vista, the public housing development on the fenceline of the refinery beyond those that were discussed in the initial set of meetings with Unocal. Additional health care and particulate matter reductions, Bayo Vista residents' priority considerations, were never addressed. In addition to excluding additional issues, initial proposals for high-valence items were also kept incomplete at first, making it more difficult for the parties to interpret parties' expressed demands or engage in a bridging strategy.

A final barrier to integrative bargaining occurred when Unocal rebuffed many of the committees' early items for negotiation. When this happened, community representatives sought additional resources from Unocal in return for their reluctance to address certain issues or proposals. A series of trades along these lines ensued. For

example, Unocal was opposed to CBE's participation in annual audits that the company traditionally conducted at the facility. CBE agreed to drop its demand for inclusion in exchange for an increase in funding for the communities. Interviewees agree that there was often pressure to "take some of the environmental and safety improvements away" in exchange for more money. Unfortunately, they admit that they were not as capable of estimating dollar values for their proposals as they were of envisioning them. Thus, it proved difficult at times to gauge whether the trades were fair from the community's standpoint. Without adequate understanding of what each proposal entailed financially, residents were prone to anchoring, framing, and overconfidence effects introduced by the company. Nearly all of the initial financial allotments that appeared in the December 9 version of the GNA were first offered by Unocal. The refinery was also responsible for setting many of the perceived reservation levels that bounded counteroffers. For example, when a Tree Maintenance Program was proposed at a cost of \$50,000 per year for 20 years, it was tabled by Unocal. Similarly, initial proposed additions to studies (i.e., \$70,000 extra for health effects study) and community development contributions (i.e., \$50,000 extra for two towns per year) were rejected at first, even while programs projected to cost millions of dollars were accepted. Following these rejections, nearly all proposed changes were valued in the tens of thousands (with the exception of conditional promises valued in the hundreds of thousands such as school improvements linked to a proposed study's results). Unocal's initial rejections coupled with the committee structure also introduced framing effects, as the generation of proposals by committees ceased and efforts shifted to adding substance to those that survived the issuance of the first draft. Not one committee proposal excluded from Unocal's initial draft was

reintroduced after December 12, with the exception of a siren in Crockett that had been under development before the Catacarb release and a bus turnaround at Hillcrest. This dynamic was also made possible by residents' overconfidence in their ability to specify proposed studies and multi-year commitments so as to ensure adequate implementation. A final bias was the sacredness of certain proposals, such as fenceline monitoring. This program was viewed as mandatory by many on the Negotiating Committee, even though the technology was uncertain and many lower-cost programs could have yielded more substantial improvements to community preparedness and resident notification.

The inventiveness of committee proposals, urgency of local residents, and number of meetings with Unocal management and experts were not sufficient to ensure adequate representation of emergency response and notification in the final agreement. Because there was no effort to understand the constraints (mostly Unocal's) defining the initial set of feasible offers (the December 9 single-text draft), develop or add new offers to expand the set following the initial draft, or identify new attributes related to the roles and routines which governed refinery operations, citizen capabilities, or industry-resident or industry-agency interaction that could be used to change the dimensionality of the offer set, integrative bargaining did not occur in this case. The only potential source of organizational change was a multi-million dollar investment in technology, which presented its own limitations to avoiding future Catacarb's.

Technology in Practice Limits

The primary means of "avoiding future Catacarb's" was to win Planning Commission support for a fenceline monitoring system that could keep track of toxic air

pollutants as they crossed refinery property. Local proponents of this technology included Andy Mechling, a camera specialist who developed unparalleled expertise in available monitoring models and their capabilities. CBE provided a great deal of support as well for inclusion of such a system in the GNA and permit, efforts that had been less than successful in previous attempts with Shell Oil and Chevron. The original signatory organizations entered into a memorandum of understanding (MOU) in November 1996 regarding installation of a fenceline monitoring system.⁴¹⁴ This agreement followed numerous meetings with Unocal during which such issues as detection time (short detection time was called for so that the equipment could be sensitive to “hazardous releases of emergency nature”), best available technology, and data sharing were discussed. Community representatives claimed that Unocal was out of compliance with each of these issues during the initial pilot testing period, called for in the company’s land use permit:

By January 31, 1995, the applicant shall submit to the Zoning Administrator for review and approval a monitoring test program for a fenceline monitoring system as specified below. The system, if approved by the Zoning Administrator, shall be in place and operating by November 1, 1996, and shall fully incorporate the best available technology. Unocal will test and install an improved air pollution monitoring system that is mutually agreeable to the signatories of its Good Neighbor Agreement and the County Zoning Administrator as outlined below: Unocal...will design a monitoring test program that will include infrared or other state-of-the-art remote sensing technology by January 31, 1995. The test program will be designed to determine the effective range of the monitoring instrument, the compounds that the instrument is able to detect, the accuracy of the instrument at different ranges for detectable compounds, the reliability of the monitoring instrument at different ranges and for detectable compounds, the suitability of siting options, including the effect of localized environmental conditions (i.e., highways, fog, rain, wind, etc.), identification of specialized operation and maintenance requirements, and the best means of recording the data collected.⁴¹⁵

The MOU resolved some of the above issues, while implementation of the pilot program, system construction, and use of the monitors raised countless others. The most important issues resolved in the MOU included the kind and location of monitors, monitor spacing, compounds monitored by each kind of monitor, how data would be

recorded, summarized, and made available to the public, system maintenance, and whether the system would be able to trigger various elements of the County's Community Warning System. While the monitoring system was still in the design stage, members of SEA began to seek grants from the EPA and other sources for studies to measure pollutant load in Crockett and to engage in epidemiologic studies using the data.⁴¹⁶ Such a study would have been unprecedented. Equally innovative were proposed efforts to incorporate the system into the County's existing emergency notification network. In addition, the technologies employed were relatively untested in the context of monitoring refinery emissions. They included "open path optical remote sensors," which send beams of light through the open air toward reflectors and gather "fingerprints" of the chemicals that pass by the light. Every time chemicals pass the light, a portion of the beam is absorbed, leaving a distortion in the beam of various wavelengths. These fingerprints are compared to fingerprints in the monitor's internal library to determine the chemical makeup of what has passed the beam. Three types of open path optical remote sensors were used as part of the refinery monitoring system:

Fourier Transform InfraRed (FTIR): uses an invisible beam of infra-red light reflected off of a mirror and returned to a detector, which looks for changes in light intensity at various wavelengths; chemicals monitored can be programmed into the system, which saves raw data for further analysis; over 300 chemicals can be detected by an FTIR during post-analysis.

Tunable Diode Laser System (TDLS): uses infra-red reflected off a mirror; looks for light intensity changes at specific wavelengths; can measure hydrogen sulfide and ammonia.

Ultra-violet (UV): uses UV light and scans various wavelengths; can measure benzene, toluene, xylene, carbon disulfide, and sulfur dioxide.⁴¹⁷

Access to data from the above systems was limited in the MOU to video output for one recipient from a camera trained on the fenceline monitoring computer screen in real time.⁴¹⁸ Residents were also allowed up to six requests for raw spectral data that

were stored by the monitoring system.⁴¹⁹ By February 1997, the company reviewed means of accessing the data, including video transmission, internet, remote access and control software, and view-only supervisory software. It concluded that the latter was the only technology that could satisfy elements of the MOU pertaining to speed, image transfer, and security.⁴²⁰ Thus it was determined that a single resident of Crockett would receive software so that continuously updated levels of various chemicals could stream across their computer screen in real time. The usefulness of these data has depended in large part on the person receiving the data stream. Even in June 2002, Bill Concannon, who presently receives the data stream, has no means of recording the data.⁴²¹ Thus, he can only check the computer screen, showing concentrations of 36 chemicals as they cross beams of light beamed 1,000 meters across the north and south sides of the refinery.⁴²² Raw spectral data, received monthly by Andy Mechling, are converted by a company in Houston, TX into what is visible on the screen. The company, Petris Technology, uses an air dispersion modeling program that takes the monitoring data and real-time meteorological data in order to generate plumes and estimate concentrations downwind.⁴²³ Unfortunately, it is difficult to compare concentrations on the screen to regulatory standards. It has also proven a challenge to link the system to existing emergency response networks.

Normally I first call the refinery because I figure if there's a problem I want the refinery to be alerted to it so that they can deal with it. Because the people in Houston, they're just basically interested in making sure that they do their job right which is to run the equipment right. And I'm mostly interested in impacts from the refinery. So that's my goal is to top that. And a couple of times I found stuff and sure enough there's been an open tank or they've had some problems or one thing or another. We had a hydrogen sulfide release that actually showed up on the refinery monitor, which is, that would be something we'd want to see... We call AQMD and they'll send somebody out, I mean you know it's not that bad, I don't expect them to just have somebody sitting outside Crockett standing by waiting for our calls, we don't call that often. But one of the reasons why we don't call more often is that by the time they show up, if there's no odor they're kind of going, well, and we go, well, and you know.⁴²⁴

At the time, Concannon did not have the capability of recording what had passed across his screen, meaning any proof of elevated levels of toxic chemicals would have to wait until receipt of the raw data.

In April 1999, members of the fence line committee entered their grievances with the monitoring system into the public record through the Community Development

Department. Concerns expressed by the committee included:

- FTIR equipment is operated so as to only detect higher levels of chemicals, without optimizing the detection limits readily achievable by the technology (contrary to the Planning Commission's suggestion that the system be designed to enable detection of ongoing, day-to-day, lower levels of pollutants in addition to higher levels)
- Raw data is not saved for UV or TDLS equipment (meaning some of the chemicals of greatest concern to the community, including BTEX (benzene, toluene, ethylene, and xylene) chemicals, could not be subjected to post-incident analysis by the community)
- FTIR will be prone to false negatives, false positives, and poor detection limits
- UV data are unreliable; there are repeated instances where the detector will swing from a large negative number to a large positive number; monthly reports only include positive portion of the swing, even though baseline levels of emissions are often recorded as far below zero
- TDLS data are problematic, and a quality assurance system needs to be in place for independent measurement to determine if the equipment is operating properly⁴²⁵

In an effort to further evaluate and improve the system, SEA, CBE, and the County Health Services Department formed a working group with Tosco (who by then owned the refinery), AQMD, California EPA, California Department of Health Services, and the EPA. Under an Environmental Monitoring for Public Access and Community Tracking Program (EMPACT) grant, members of SEA (and later the working group) conducted detailed analysis of the monthly raw data that had been collected.⁴²⁶ Many of the same findings were noted in the working group's report, which recommended that data from the FTIR be released on a website for one compound – total hydrocarbons, reported as butane – as a pilot effort.⁴²⁷ Efforts to minimize false positives and negatives were also proposed. To date, the data have not been posted in real time on a website.

The report also found that system alarm levels that were set before the monitors went online in 1997 had never been reached. It was noted that

The absence of an alarm level may not necessarily reflect the lack of potential threat to the public during a particular incident – it may simply mean that a release has not crossed the beam path, or not crossed it in a sufficient concentration to trigger an alarm. At times releases have come from high stacks and/or at high temperatures and have gone up and over nearby areas, rather than diffusing or blowing along the ground near the monitors. In some such cases, including some refinery fires that have occurred in the County, County Health Services has called a shelter-in-place since wind conditions are unpredictable and change rapidly. Levels reported by the fenceline system are also related to and may be affected by the length of the monitor’s beam path.⁴²⁸

The report concluded that “information from the open-path monitors at Tosco Rodeo cannot at this time be relied on by itself for community emergency notification.” Other efforts to improve notification during industrial accidents, a primary concern expressed in negotiations, were of similar consequence. As those interviewed agreed that the County resisted efforts to monitor data from the fenceline monitors or make use of the data to improve enforcement, there is also a sense that the County was reluctant to address its community warning capabilities.

That’s why I wanted a Level Two warning. I said that if we had another Catacarb incident tomorrow, the County would not pull the plug because Catacarb was not listed as a hazardous material, and Unocal would certainly never pull its plug by itself, push the button for the alarm. Never, never, never, especially with the first bunch of administrators over there. And they had no infrastructure working. The County system wasn’t working. We would never be informed. And one of the things that we designed were whistles over here for the County early warning system and then of course there was this great debate, because the County said well, people don’t like whistles, they don’t like sounds, and we said bologna, people want to be notified. And then the question was when would they have the test and so it’s tested once a month to make sure that it works. And then all they needed to do of course was to get one individual saying well, I don’t want it over here, because it’s next to my house. Then we have to go through all that. We had to deal with all the details. We essentially had to engineer and plan everything for Unocal and the County.⁴²⁹

We wanted the County to have [the fenceline monitoring data]. And the County said we really don’t want that, after all, we rely on Unocal. Yeah, they call you three hours after an incident, that’s terrific. You guys need us. Well, who’s gonna watch it? Well, no one’s watching. Well, maybe you could have an alarm on it, you know, there’s software to put an alarm on it, so it could ring a bell, so someone over at public health, well, there’s no one over there at night. Well, maybe it could ring somewhere else, like 911. On and on and on. There’s always a reason not to do it. And my fear is that we are not prepared.⁴³⁰

Listen to this: When we were doing this EPA grant, we were sitting at the table. We’re sitting at one of these meetings, we’ve got people from hazardous materials at the County there. We’re

talking to them about, they have a monitor themselves, and when they got this money for this grant, all of a sudden they hooked it up. They said but it doesn't work really well, it's really not reliable, that was their constant theme why they didn't use it. The County. They were hooked up to all of them, the FTIR, the UV, and the laser. Anyway, they could have been hooked up. At any time, they had the ability to be hooked up. Unocal agreed that would be fine. So they had this equipment. What did they do with it? They stuck it in a hallway being a door upstairs where nobody goes. And we didn't know this until I started questioning them in one of these meetings we were at with the EPA during this. Now this is years later. This thing's been up since 1997. And this is like 3, 4 years later. And I said well, why don't we plug it in and bring it out? Well, yeah, I guess we could do that. Then you need somebody to use it. Oh, my God, it was a nightmare.⁴³¹

Of primary importance to residents was the fact that only "Level Three" incidents result in public alerting of any kind. Catacarb-type incidents, should they occur in the future, would be considered at most Level Two incidents, because of the lack of a major fire or explosion or the presence of an off-site impact suspected of causing health problems while the incident is ongoing.⁴³² Level Three incidents by definition also have to involve hazardous materials. For this reason, residents have tried to convince the County to develop an alert system that would notify sensitive receptors, or those who are most vulnerable to even low concentrations of certain chemicals, in the event of incidents that did not qualify for Level Three notification. Residents contend that such a system continues to fail to notify those in greatest need. Following a series of three incidents at the Rodeo refinery in April 1997, residents testified to the County's Hazardous Materials Commission that the existing Community Warning System *in general* could not work in the ten minutes that it took for releases to reach Crockett.⁴³³ While the refinery had provided sirens and some technical support, notification capabilities continued to fall short of resident expectations. Community negotiators' hopes that millions of dollars worth of monitoring equipment could be incorporated into an improved emergency response network had not been met.

The Limits Revisited

The Unocal Catacarb spill demonstrates how an industrial accident can unearth strategies used to simplify response to a crisis by plant operators and managers, which can have the effect of exacerbating a release and its effects on neighboring communities. Examining the response, negotiation, and implementation phases that followed shows how remarkably resilient these roles, routines, and structural aspects of refinery management are to consideration and change by parties to a post-accident dispute. Absent an effective means of considering such challenges as reconciling interpretations of refinery condition changes, bringing bits of organizational memory across refinery units, decoupling the effects of unit stabilization efforts from broader input-output trends and the condition of refinery catalysts, enabling workers who would question the decisions of upper management and how they frame problems, encouraging dialogue and interaction across divisions, and allowing workers to take potential outcomes of their decisions to their logical conclusions before they act, these problems can easily be “black boxed” by the time residents sit down with refinery managers to negotiate a settlement to their grievances. We have seen how administrative actions, based heavily on existing regulations, will sidestep such issues, dealing instead with weight and concentration limits for certain compounds, agency notification requirements, changes at the margins of existing programs (i.e., training initiatives), and easily reportable and verifiable actions. Efforts to achieve integrative bargaining during the negotiation phase are further limited by a lack of appropriate representation of a cross-section of facility operators and management, the absence of any real discovery process before deliberations begin, the tendency of post-accident response to be administered by a facility’s legal department,

the span of available windows of opportunity for negotiation, the anchoring effects of a draft settlement, challenges of collective bargaining for members of several distinct communities, and incentives for industry to issue concessions to parties external to the face-to-face discussions. In light of these limiting factors, technological fixes can appear to hold the potential for altering roles and relationships that exist between refinery personnel, residents, and officials and correcting informational asymmetries within and across stakeholder groups. Yet as discovered by residents of Crockett, Rodeo, and Bayo Vista, technology, here in the form of a fenceline monitoring system, introduces its own set of expected behaviors and limitations of operation. A system that promised to improve community notification instead yielded an endless stream of data that could only be used for calibration, cross-referencing, and interpretation weeks after each spectral file was collected. Residents discovered how a technological artifact cannot simply be molded to suit the needs of diverse publics using available means of post-settlement deliberation.

The bargaining power of residents, built upon the expertise of their organizations, the specificity of their proposals, the sense of urgency brought about by the Catacarb spill and post-accident revelations, legal action, and agency attention, and conditions imposed by the Planning Commission, was not without its drawbacks. After mid-November 1994, access to decision-making and the ability of certain affected areas to influence policy was limited by the solidification of committee membership. Indeed, the solution space available to residents who *were* given access to the negotiating committees had already been limited by Unocal's prior dealings. But a number of issues remained open for discussion, and a broad group of representatives of the four communities was involved in

every step of the negotiations. How are we to interpret the resulting GNA in principle, which represented a commitment to invest nearly \$15 million in a broad range of programs?

The answer to these questions can be found through the careful comparison of GNA provisions with previously agreed-to permit conditions. Fully 57% of the financial commitments in the GNA represented previously agreed-to conditions of permit approval. The only items that represented substantial improvement over existing permit conditions encompassed direct financial contributions to the towns and to vocational training, both to be paid over a period of 15 years. Remaining items that represented somewhat of an improvement over permit conditions included three issues linked to strong committees with the expertise to craft detailed proposals regarding Hillcrest school improvements, landscaping, and emergency preparedness. Yet these represented only 9% of the entire package, with emergency preparedness/community warning, the most pressing issue to emerge after the Catacarb release, receiving less than 1%. Entire sections of the GNA represent compromises or “something close to the bottom line” for the committees. Most readily excluded from negotiations were ideas relating to questioning “normal operating procedures” of both the refineries and their monitoring agencies and establishing new roles for local residents in plant inspection, pollution patrols and citizen monitoring, and early warning and notification. Remaining items included promised studies with few links to action, and a desperately needed medical clinic. This negotiation illustrates how a company seeking permission for one of the most expensive capital improvement projects in the history of California, facing strict deadlines and the likelihood of major restructuring, remained as close to existing permit requirements as possible and focused

most of its concessions on monetary commitments unrelated to the facility itself. What concessions it did make beyond monetary contributions required significant post-settlement deliberations, the use of novel technology, and intensive data-gathering exercises leading to few actions conditioned on findings.

Appendix A: Refinery Worker Actions during Catacarb Release, Aug. 22-Sept. 6, 1994

#	WORKER	TITLE	SUPERVISOR	22
1	Plesh	General Manager	Felderman (VP, Refining - in LA)	Notified of leak from 2; aware of rate reduction; 2 said he would talk to appropriate personnel re: ability to run with hole in tower; 2 decided to hold rates; called Felderman; SI w/ 2 (safe to operate w/ monitoring); called Felderman
2	Clark	General Superintendent of Operations	Plesh	Notified by 3; asked 3 to get together appropriate people; SI w/ 3 (hold rates); M w/ superintendents; left early for M w/ 3, 5, 15, 19, etc. - consensus - alright to run, monitor; RI of Warren Smith, 3 re: reporting requirements; reviewed MSDS's; SI w/ 1
3	Crawford	Superintendent of Hydrotreating	Clark	Notified of leak, RI from 5; SI w/ 2; M, M; RI from 6; SI w/ 2 (re: online repairs); WO to 19; M w/ 13 (no response)
4	Carroll	Superintendent of Maintenance	Clark	V (very little maintenance responsibility for deciding what to do about leak)
5	Ferneau	Process Foreman	Clark	Notified of leak when arrived at gate; went to office; put on coveralls; went to unit control room; told them to reduce rates; O (didn't see C); SI w/ IC; called 3, told to reduce rates; O; call from 2, 3; asked 17 about parameters, told him to hold rates; asked Winship, 15 re: repair, metallurgy records; M (3 options) - decided to run; put together observation log w/ 19; M w/ maintenance re: repair while operational - none; Whitney told of spots on car
6	Iverson	Advisor, Env Programs	Clark	Notified of leak. Researched reporting regulations
7	Arabzadeh	Manager, IH - LA	Gary Spivey (IH Manager)	NA
8	Fernandez	Operator	Stefan	Notified of leak by 21; told to keep log; O (some C leaking to ground)
9	Willson	Fire Protection Shift Supervisor	Renshaw	Notified of leak, under control; SI w/ Miller (agreed should have been shut down); SI w/ 16 (expressed disagreement with decision); SL
10	Capers	Hydrotreating Shift Supervisor	Clark	V
11	Alexander	Bulk Shift Supervisor	Garcia	Notified of leak
12	Van de Hoef	Bulk Shift Supervisor	Garcia	NA
13	Young	Shift Supervisor	Crawford	Notified of leak by phone; RI of 17; O; SI w/ 22; M w/ 3 and maintenance supervisors; filled out accident investigation report (mainly based on information "passed on" and "educated guesses" - indicates corrosion is cause)
14	Hess	Head Operator, Unit 240	Ferneau	Notified of leak (was under control by this time); O; 8 to tell 14 if leak gets worse (no need to read log kept by operator, which went to 5)
15	Malhotra	Corrosion Engineer	Stellina	Notified of leak; asked for vessel history folder; told emergency under control; looked at leak location with 5, others (tried to figure out leak location); M (shared estimate that it was mechanical damage); decided could run if leak stays the same; O
16	Partam	Shift Supervisor	Renshaw	Notified of leak; SI w/ 20; M; SI w/ County Health Service (vibration-induced leak, would be monitored); RI from Miller ("ridiculous decision"); O ("pinhole," brown staining)
17	Hodges	Head Operator	Crawford	Notified of leak; told operators to go to control room; found leak; turned in em; Larry Stefan said would have to get 2 nd stage normal before SD; alarms going off at board; 5 says cut rates; call from 3 - hold rates, bring back up
18	Martin	Plant 4 Operator	Ferneau	V

#	WORKER	TITLE	SUPERVISOR	22
19	Barker	Hydrotreating Engineer	Crawford	RI from 3; O; M; assumed 2 or 3 would check with HSER, Env.; M w/ 5 (re: solution strength – should work be done on tower), Stephan (re: check the liquid seal on bottom of 407); RI of 15; brought MSDS's to 2; spoke with 22 about leak (didn't know he was IC); MOC proposal; 3 signed it; M w/ Stevens (re: technical review of proposal)
20	Garcia	Emergency Response Training Supervisor (IC for part of release)	Renshaw	Notified of leak; report to staging and 22; SI w/ 22, 21, 13, etc. – potential of leak “nil” but concerned with integrity, potential escalation; SI w/ 16; went home, discussed w/ carpool home; prepared to talk to Renshaw
21	Wang	Senior Operator	Ferneau	Asked to check D-409 by 17; reported leak; staged near leak; SI w/ Tony Day (said overhead vented same as leak – I disagreed); SI w/ 5 (shut down, watch stain to see if it grew); response team arrived – ordered cut in rates; SI w/ 20 (pH of material); 5 told me to keep running, log

#	WORKER	TITLE	23	24
1	Plesh	General Manager	RI of 16, O	RI from 2
2	Clark	General Superintendent of Operations	In LA for reformulated gasoline meeting; told General Manager of Refinery Planning re: possible early shutdown	Report of film on Unit 200; M w/ 16, Jim Matthews re: verify that no health effects, no reason for personnel monitoring (none could be done, no health risk); SI w/ 1; received Process Evaluation (no HAZOP)
3	Crawford	Superintendent of Hydrotreating	R Obs; SI w/ 5; AI from 16; RI from 2; SI w/ 16; All Clear; sign incident report; copy to HSER	R Obs; O; M
4	Carroll	Superintendent of Maintenance	V	V
5	Ferneau	Process Foreman	NA	Saw spots on Coker unit (appeared new); told 3
6	Iverson	Advisor, Env Programs	SI w/ 3 (re: reportable quantities – none); heard of brown stain around leak area – told no C in plume	At some point before the 31 st , SI w/ 5 (5 said no change in leak)
7	Arabzadeh	Manager, Industrial Hygiene – in LA	NA	NA
8	Fernandez	Operator	O (blowing forcefully, little or no C)	O
9	Willson	Fire Protection Shift Supervisor	SI w/ Fred Welsh (he was told to call all clear); understood that fire protection's unhappiness passed along to senior HSER management	SI w/ 20 (discussed possibility of overspray, questioned operations' opinion that no C in that part of tower); SL
10	Capers	Hydrotreating Shift Supervisor	V	V
11	Alexander	Bulk Shift Supervisor	NA	NA
12	Van de Hoef	Bulk Shift Supervisor	NA	NA
13	Young	Shift Supervisor	O (more defined hole); heard All Clear announced; general discussions w/ operators	Other assignments away from area of leak
14	Hess	Head Operator, Unit 240	O	O
15	Malhotra	Corrosion Engineer	O; SI w/ Sadoian; SI w/ 16; RI of 2 or 3 (told all is fine with leak)	O

#	WORKER	TITLE	23	24
16	Partain	Shift Supervisor	Call from 1; why no All Clear ; SI w/ Welsh (IC for the day); RI of 15; RI of Matthews w/ Welsh; RI of operators, 3, Komplin (filling in for 2) re: thoughts about All Clear ; instructed Welsh to blow All Clear (Welsh disagreed)	2 asked for info on IH monitoring, health effects (because 16 filling in for Renshaw); M w/ 2, Matthews (didn't know what to monitor for)
17	Hodges	Head Operator	All Clear , heard they'd run until TA	NA
18	Martin	Plant 4 Operator	Told of leak by heavy equip. operator	SI w/ 21 (told of log); SI w/ operators; O (brown center); SI w/ Delege (operations, not health impact)
19	Barker	Hydrotreating Engineer	Heard of All Clear ; 3 told of no MOC , no HAZOP ; heard of Coker complaints from 3;	Read process review – reviewed plant ops and found to be stable
20	Garcia	Emergency Response Training Supervisor (also IC for part of release)	RI of Welsh re: asked marine operator to call All Clear	NA
21	Wang	Senior Operator	V	V

#	WORKER	TITLE	25	26
1	Plesh	General Manager	TA meeting	NA
2	Clark	General Superintendent of Operations	TA meeting – unrelated	Planning meeting - unrelated
3	Crawford	Superintendent of Hydrotreating	R Obs; O	R Obs; O; M
4	Carroll	Superintendent of Maintenance	V	V
5	Ferneau	Process Foreman	Asked 2, 3 to have management presence on unit	NA
6	Iverson	Advisor, Env Programs	NA	NA
7	Arabzadeh	Manager, Industrial Hygiene – in LA	NA	NA
8	Fernandez	Operator	V	V
9	Willson	Fire Protection Shift Supervisor	V	V
10	Capers	Hydrotreating Shift Supervisor	Heard of leak from Stefan; told by 3 to monitor, keep informed with operators (never told to write down)	NA
11	Alexander	Bulk Shift Supervisor	NA	NA
12	Van de Hoef	Bulk Shift Supervisor	NA	NA
13	Young	Shift Supervisor	Other assignments away from area of leak	Other assignments away from area of leak
14	Hess	Head Operator, Unit 240	O (small amounts of C)	Received no information on what to do if leak worsened (no knowledge of contingency plans)
15	Malhotra	Corrosion Engineer	O	O
16	Partain	Shift Supervisor	NA	NA
17	Hodges	Head Operator	NA	O (noticed changes in color); at some point, 21 complains of breathing problems
18	Martin	Plant 4 Operator	O (getting worse – force of leak)	O ("no change – from previous entry")

#	WORKER	TITLE	25	26
19	Barker	Hydrotreating Engineer		
20	Garcia	Emergency Response Training Supervisor (also IC for part of release)	NA	NA
21	Wang	Senior Operator	Off of day shift; O (C visible in plume)	Consensus among operators that it was not just steam and CO2; O (C in phases, odor detectable, more spots on ground)

#	WORKER	TITLE	27	28
1	Plesh	General Manager	NA	NA
2	Clark	General Superintendent of Operations	V	V
3	Crawford	Superintendent of Hydrotreating	Away	Away
4	Carroll	Superintendent of Maintenance	V	V
5	Ferneau	Process Foreman	NA	Felt that feeling of abandonment led to what some operators wrote in log
6	Iverson	Advisor, Env Programs	NA	NA
7	Arabzadeh	Manager, Industrial Hygiene - in LA	NA	NA
8	Fernandez	Operator	O (bigger, odor, increase in spotting behind tower - knew years before that degraded DEA carcinogenic)	O (continued to accumulated on lines)
9	Willson	Fire Protection Shift Supervisor	V	V
10	Capers	Hydrotreating Shift Supervisor	NA	NA
11	Alexander	Bulk Shift Supervisor	NA	NA
12	Van de Hoef	Bulk Shift Supervisor	NA	NA
13	Young	Shift Supervisor	V	V
14	Hess	Head Operator, Unit 240	O (started seeing C)	Told of C on Coker unit; checked MSDS books; O (increased size)
15	Malhotra	Corrosion Engineer	NA	NA
16	Pattam	Shift Supervisor	NA	NA
17	Hodges	Head Operator	NA	O (C puff has stopped w/ no new C on ground)
18	Martin	Plant 4 Operator	O ("starting to accumulate"); SI w/ Delege (head operator); "If they were reading the log, they should be making a decision - soon."	O ("still blowing Catacarb")
19	Barker	Hydrotreating Engineer	V	V
20	Garcia	Emergency Response Training Supervisor (also IC for part of release)	V	V
21	Wang	Senior Operator	Another operator noticed C on lines	Sick - flu-like symptoms

#	WORKER	TITLE	29	30
1	Plesh	General Manager	M w/ 2, 4 (summary of leak; did not discuss monitoring data or repair); requested M re: repairs without SD	M (safety – regularly scheduled)
2	Clark	General Superintendent of Operations	M w/ 1, 4 re: leak, maintenance workers' complaints of C fallout; verified w/ Renshaw no need to monitor; in LA for p.m.	In LA
3	Crawford	Superintendent of Hydrotreating	R Obs; O; M	R Obs; O
4	Carroll	Superintendent of Maintenance	M w/ 1, 2; told 2 met with HS/ER and EAD and found no risk; maintenance concerned that not enough information; heard of staining on tower; related to 2	Told Zone C workers noticed Catacarb fallout in work areas; several supervisors differed on leak (larger vs. same size)
5	Ferneau	Process Foreman	NA	O (saw discoloration from office); told 3 of brownish plume; checked instrumentation, samples – no indication of C loss
6	Iverson	Advisor, Env Programs	NA	NA
7	Arabzadeh	Manager, Industrial Hygiene – in LA	NA	SI w/ Renshaw (heard about leak); asked if needed hygienist for monitoring – told no; IH to make regularly scheduled visit to SFR on 6 th
8	Fernandez	Operator	O (no change; puff has stopped); asked Stefan when shutdown)	O (slight increase)
9	Willson	Fire Protection Shift Supervisor	V	V
10	Capers	Hydrotreating Shift Supervisor	NA	NA
11	Alexander	Bulk Shift Supervisor	NA	NA
12	Van de Hoef	Bulk Shift Supervisor	V	V
13	Young	Shift Supervisor	V	V
14	Hess	Head Operator, Unit 240	O	O
15	Malhotra	Corrosion Engineer	M w/ Stellina (briefing on leak); O	O
16	Partam	Shift Supervisor	Updated Renshaw; health and safety responsibilities re: the leak rested with him; Received memo	NA
17	Hodges	Head Operator	NA	O (no change)
18	Martin	Plant 4 Operator	O (“Still blowing Catacarb”)	NA
19	Barker	Hydrotreating Engineer	Drafted AFE; O (leak getting worse)	O (plume includes “brown puffing”)
20	Garcia	Emergency Response Training Supervisor (also IC for part of release)	NA	O; SI w/ Renshaw re: not normal to run with leak (told it is an operations decision and C is harmless)
21	Wang	Senior Operator	O (discolored cloud, wet spots at base, hoped HS committee would intervene)	Parked car in different location; thought about making public appeal, turning off G-405 C pump

#	WORKER	TITLE	31	1
1	Plesh	General Manager	Discussed MSDS's w/ Partain	NA
2	Clark	General Superintendent of Operations	Draft memo to Renshaw, 3, 4, Matthews to review	In LA
3	Crawford	Superintendent of Hydrotreating	R Obs; O; M	In LA
4	Carröll	Superintendent of Maintenance	Talked to maintenance planning supervisor about TA, moved up start of field work, building of scaffolding; discussed problems with early TA with 2, 3	Maintenance workers tell 4 that leak is very slowly increasing
5	Ferneau	Process Foreman	Normality 4.32	O (saw discoloration)
6	Iverson	Advisor, Env Programs	NA	NA
7	Arabzadeh	Manager, Industrial Hygiene – in LA	NA	NA
8	Fernandez	Operator	O (hole enlarged a bit), normality 4.32; SI w/ 14, S	O (increased slightly)
9	Willson	Fire Protection Shift Supervisor	V	V
10	Capers	Hydrotreating Shift Supervisor	O	NA
11	Alexander	Bulk Shift Supervisor	NA	NA
12	Van de Hoef	Bulk Shift Supervisor	Noticed staining on tanks; O (longer)	Staining still there; O
13	Young	Shift Supervisor	V	V
14	Hess	Head Operator, Unit 240	O; didn't hear of drop in normality (told person plotting results to inform him of significant changes); would only review C results if trouble with methanator	O
15	Malhotra	Corrosion Engineer	O	V
16	Partain	Shift Supervisor	NA	NA
17	Hodges	Head Operator	NA	"Would take an act of Congress to stop it"
18	Martin	Plant 4 Operator	NA	Lost part of unit; bringing it back up in swings
19	Barker	Hydrotreating Engineer	O (leak looked better)	O (worst she had seen it); SI w/ Stephan; tried to get 2 to observe; operators asked if TA early; tried to find 3 (in personnel all day); unplanned shutdown caused rates to go down; plume looked better
20	Garcia	Emergency Response Training Supervisor (also IC for part of release)	NA	NA
21	Wang	Senior Operator	O (hole enlarged); running unit became difficult; looked into contacting OSHA	V

#	WORKER	TITLE	2	3
1	Plesh	General Manager	SI w/ Renshaw	V
2	Clark	General Superintendent of Operations	Asked 3, 4 to put together team to look into on-line repairs (no solution); memo released; by now had not seen any monitoring results (thought 3, 5 were reviewing)	V
3	Crawford	Superintendent of Hydrotreating	R Obs; O (saw no brown); M; M (re: repair possibilities)	V
4	Carroll	Superintendent of Maintenance	Aware that Catacarb observed in Coking unit; O (plume larger; C); request for maintenance on side of tower (transmitter needed repair); personnel raised objections to repairs w/ 5; asked by 2 to form team to look at leak containment; 3 and 5 unwilling to relax standards for work on tower; told 2 unable to repair while operational	V
5	Ferneau	Process Foreman	Normality 3.59; (saw discoloration); looked into potential repairs (not feasible)	V
6	Iverson	Advisor, Env Programs	NA	V
7	Arabzadeh	IH Manager	NA	NA
8	Fernandez	Operator	O (sharp decrease in normality); heard of C on tanks	V (brought wife to see plume: "why is it brown?")
9	Willson	Fire Protection Shift Supervisor	V	V
10	Capers	Hydrotreating Shift Supervisor	NA	NA
11	Alexander	Bulk Shift Supervisor	O (just steam); SI w/ Pericoli; viewed streaks on one tank	V
12	Van de Hoef	Bulk Shift Supervisor	Staining getting longer on tanks; told Tom Gramata; received memo; O	Tank stains longer; Spoke w/ operator about tanks stained; O (darker)
13	Young	Shift Supervisor	V	V
14	Hess	Head Operator, Unit 240	O (spurts of C every 20 seconds; reached across the road); left work before 3.59 normality reading	V
15	Malhotra	Corrosion Engineer	V	V
16	Partam	Shift Supervisor	NA	V
17	Hodges	Head Operator	Memo from 2 - if safe as soap, why the need for safety showers?	O (C on car); told of complaints of material deposits
18	Martin	Plant 4 Operator	Memo from 2; SI w/ 21 re: MSDS's; O ("still blowing")	O ("Catacarb on the ground"); RI of 5 ("it won't hurt you")
19	Barker	Hydrotreating Engineer	O (fairly decent); SI w/ Delege re: high delta-T; M (planning meeting); received memo from 2 (C constituent %'s seemed smaller)	V
20	Garcia	Emergency Response Training Supervisor	V	V
21	Wang	Senior Operator	V	O (blowing forcefully)

#	WORKER	TITLE	4
1	Plesh	General Manager	V (call from 2 re: Complaint and 3's investigation; told about fire monitor idea)
2	Clark	General Superintendent of Operations	V (message re: Complaint ; asked 3 to assess (said saw brown stains on tanks and a couple on Wickland tanks); two calls to 4 to SI; SI w/ 1 (asked if need for meeting re: repairs – told to wait for 6 th)
3	Crawford	Superintendent of Hydrotreating	V; RI from 2; RI of 12; Complaint ; O (staining; plume white); RI from 12; SI w/ 2; visit house; SI w/ 2; SI w/ Barnhart (re: fire monitor; adding KOH)
4	Carroll	Superintendent of Maintenance	Spoke w/2 about Complaint ; concerned about growing leak (gross exposure); heard of water spray; SI w/ 2 again; 2 discussed possible mtg. on 5 th ; based on 3's inspection, could wait until 6 th ; told maintenance should prepare a plan to repair or mitigation on the 6 th
5	Ferneau	Process Foreman	V
6	Iyerson	Advisor, Env Programs	V
7	Arabzadeh	IH Manager	NA
8	Fernandez	Operator	V
9	Willson	Fire Protection Shift Supervisor	V
10	Capers	Hydrotreating Shift Supervisor	SI w/ 14 (difficulty keeping plant stabilized); decided to look at makeup of solution (saw normality results from 2 nd); SI w/ 3 (investigation of unit 215 – couldn't verify claims; Wang covered in C while adding KOH); O
11	Alexander	Bulk Shift Supervisor	V
12	Van de Hoef	Bulk Shift Supervisor	Received Complaint ; tour revealed stains further up the hill and darker on side facing D-409; heard of oily substance on car; saw spots on cars; spoke w/ IC about spotting; SI w/ 2; SI w/ 3, convinced to come to refinery, tour stained areas (stains couldn't be odor abatement)
13	Young	Shift Supervisor	V
14	Hess	Head Operator, Unit 240	V
15	Malhotra	Corrosion Engineer	V
16	Partain	Shift Supervisor	V
17	Hodges	Head Operator	Methanator rise to 86; cut rate again, same problem (indicated problem with catalyst); O (C on car)
18	Martin	Plant 4 Operator	O ("More on pipes and equipment; cloud looks like vaporized Catacarb"); learned of a Complaint ; IC and shift foreman – fire monitor
19	Barker	Hydrotreating Engineer	V
20	Garcia	Emergency Response Training Supervisor	V
21	Wang	Senior Operator	Sneezing, eyes watering when doing readings in leak area

#	WORKER	TITLE	5
1	Plesh	General Manager	V
2	Clark	General Superintendent of Operations	V (message re: Complaint – asked bulk shift supervisor if anything unusual at refinery – no; called 3 – had checked with unit that morning and nothing changed from what had told 2 on the 4 th , mentioned water spray tried)
3	Crawford	Superintendent of Hydrotreating	V; RI from Komplin re: coker unit; RI from Morofsky re: fire monitor causing a mess and coker unit complaints; ordered to shut off; asked is it worse than on Sunday; referred to 5; SI w/ 2; Complaint RI from Barnhart; SI with 5, 4 re: procedure for climbing tower
4	Carroll	Superintendent of Maintenance	V
5	Ferneau	Process Foreman	Call from 3 re: fire monitor – asked about access restrictions; told of tanks, Complaint ; called Gary Martin (head operator) to make sure he knew how to allow access (2x)
6	Iverson	Advisor, Env Programs	NA
7	Arabzadeh	IH Manager	NA
8	Fernandez	Operator	V
9	Willson	Fire Protection Shift Supervisor	V
10	Capers	Hydrotreating Shift Supervisor	SI w/ 17 (how to stabilize unit); took full C samples; reduced feed rate
11	Alexander	Bulk Shift Supervisor	Condensate falling; told to move vehicle d.t. residue on cars; heard Unit 200 complaint; SI w/ supervisors re: Complaints , ways to knock down plume; viewed staining; SI w/ 2 (said complaint couldn't be d.t. leak), Warren Smith
12	Van de Hoef	Bulk Shift Supervisor	V
13	Young	Shift Supervisor	V
14	Hess	Head Operator, Unit 240	V
15	Malhotra	Corrosion Engineer	V
16	Partain	Shift Supervisor	V
17	Hodges	Head Operator	Problems with methanator, added KOH; put more heat in bottom of tower; tried to get rid of CO ₂ ; concerned that fire monitor was cooling boilers; took full set of C samples
18	Martin	Plant 4 Operator	Took over for 17; O (still steaming Catacarb); wind shift – Catacarb toward foremen's office in parking lot; getting on cars; CO ₂ removal not efficient; methanator rise; increased stripping steam; SI w/ operators re: inspection of hole
19	Barker	Hydrotreating Engineer	V
20	Garcia	Emergency Response Training Supervisor	O (stains on vans) reported to incident commander; discussed sounding emergency; repeated concerns to Renshaw; based on Clark memo, no; RI from shift supervisors re: concern over droplets (all thought should shut down); RI of their supers (2, 3, and Smith); told don't shut down; SI w/ Renshaw – told it was operations' decision; requested input from Env. Dept. – no one came out, just called – OK to run until Tuesday
21	Wang	Senior Operator	Drenched in brown liquid d.t. fire monitor; high methanator differential; thought it would be shut down d.t. process parameters; added KOH; adjusted other factors; ordered more KOH

#	WORKER	TITLE	6
1	Plesh	General Manager	W. Smith said reports of illness at Wickland Oil; toured area near Wickland (brown on tanks, deposits on windshield); told 2 to shut down; spoke w/ Wickland manager; contacted Felderman; started TA; SI w/ 2, 4, Smith (reporting, what released, how much)
2	Clark	General Superintendent of Operations	Spoke w/ 1; told 5 to shutdown
3	Crawford	Superintendent of Hydrotreating	RI from Smith; Visit Wickland; SI w/ 2; Shutdown
4	Carroll	Superintendent of Maintenance	Noticed C on sides of tanks on Tormey Hill; drew sketches of plan to contain, collect, and dispose of leak materials; went to view surplus material to be used in containing leak; M to explore leak containment; plan adopted (to take two days); meeting interrupted – Shutdown
5	Ferneau	Process Foreman	Arrived; residue falling on car as approached; read operators' daily records; O (brown stain on lines); told all to prepare to Shutdown
6	Iverson	Advisor, Env Programs	NA
7	Arabzadeh	IH Manager	NA
8	Fernandez	Operator	Arrived when in shutdown mode
9	Willson	Fire Protection Shift Supervisor	V
10	Capers	Hydrotreating Shift Supervisor	Left message for 3 (need to order more KOH); noted discoloration on vehicle when leaving graveyard shift
11	Alexander	Bulk Shift Supevisor	NA
12	Van de Hoef	Bulk Shift Supervisor	Heard of Shutdown
13	Young	Shift Supervisor	C on windshield while driving to work; responded to downed powerline; received call about leak from corp. working in Selby (workers said they were sick); spent 45 minutes at emergency site (van and hard hats covered); Shutdown
14	Hess	Head Operator, Unit 240	Told to return for Shutdown
15	Malhotra	Corrosion Engineer	Call from Stellina (C leaking over refinery); told to come to work to assist with TA
16	Partain	Shift Supervisor	Heard of staining on Wickland's tanks
17	Hodges	Head Operator	NA
18	Martin	Plant 4 Operator	Called and told of Shutdown
19	Barker	Hydrotreating Engineer	Met with Renshaw near unit; O (browner); M planned by 4 (re: "deflect and collect" system designs); RI from 5 (Shutdown)
20	Garcia	Emergency Response Training Supervisor	V
21	Wang	Senior Operator	Surprised still running; left at 6:30 a.m.; saw brown puddles on way out

NA = no action; V = vacation; SI = shared information; RI = requested or received information; M = attended meeting; O = observed leak;

Appendix B: Good Neighbor Agreement Negotiation Process

GNA Section	Provision Number	Provision Content
Health Risk and Medical Monitoring	1	Will continue to fund health risk assessment by Montgomery Watson by January 1995
	2	A medical clinic to offer treatment and consultation to Catacarb victims will be discussed and added to this GNA
	3	Will contribute up to \$100,000 to study health impacts of Catacarb spill
	4	Will work with County as required in LUP to fund a response van operated by County (\$20,000)
Emergency Response and Community Warning	1	Will develop a database of health effect information for chemicals used at refinery
	2	Will work with County Community Awareness and Emergency Response organization to facilitate early installation of those portions of the Community Warning System that will alert the community to future events
Vegetation and Parks	1	Will plant vegetation on refinery edge and spend \$30,000 per year for 9 years to further vegetate areas (LUP Condition 63)
	2	Will dedicate portion of security road at refinery edge as dual-lane bike path
	3	Will consider supporting efforts associated with the Lindsey Museum; will contribute \$5,000 for educational programs at Rodeo, Crockett schools
	4	Will donate \$5,000 to Carquinez Strait Preservation Trust to develop Tree Management District
School Safety	1	Will install permanent monitoring station at Hillcrest School to detect sulfur and hydrocarbons
	2	Will continue to provide education and training on how to respond to an emergency
	3	Has contributed \$378,000 to Hillcrest for weather stripping under LUP Condition 75; will fund assessment of school facilities in district to identify risks attributable to Unocal's operations
	4	Will work with Bayo Vista Child and Family Center to address safety concerns at the facility
Vocational Training	1	Will make a long-term commitment to the Vocational Training Program at John Swett High School
	2	Will develop a program to advertise jobs as they become available at the refinery within the local community
	3	Local hiring outreach program will attempt to increase the number of job applicants for Project construction
Transportation	1	Will mitigate potential traffic impacts from construction of the Project through traffic control and staggered construction
	2	Will contribute \$4.5 million to County for improvements to local infrastructure as part of LUP
	3	Will replace use of anhydrous ammonia with aqueous ammonia by Dec. 31, 2001
Environment	1	Commits to implement a fence-line monitoring test program to include infra-red or other technology
	2	Will fund independent audit of the facility's emergency response plan; oversight committee will be established
	3	Use of anhydrous ammonia will be eliminated by 2002
	4	Hydrogen sulfide cannot be eliminated; Unocal will share results of Hazard and Operability Studies
	5	Proposes monthly monitoring of valves/pumps and replacement of same to reduce fugitive emissions by 787 lbs/day
	6	Any air emissions offsets for Project will be from sources as close to local area as possible
Financial	1	Will increase contribution required by LUP to \$200,000/yr. for 15 years for local area
	2	Half of increase will be deposited into savings account for Crockett Foundation and half to Rodeo organization
	3	Use of funds to be decided by two panels, each with 3-4 residents and 2-3 Unocal employees
	4	Each side will appoint their own representatives
	5	Panels will develop procedures for giving notice of available funds and for soliciting proposals
	6	Funds not awarded will be carried over to the following year
	7	No funds will be used by any person in a manner adversarial to the interests of Unocal
	8	No salary will be paid from these funds to individuals charged with administration/oversight of funds
	9	At conclusion of 15 years, Unocal agrees to negotiation regarding continuation of payments

GNA Section	Provision Number	Provision Content
Legal	1	Parties will notify all other parties if they believe a party to be in breach of a material term of this GNA
	2	All parties will enter into good faith discussions to resolve such issues
	3	If agreement cannot be reached, parties will submit dispute to Zoning Administrator; decision shall be appealable to Board of Supervisors
	4	If Unocal in breach, sole remedy shall be revocation or amendment of LUP
	5	No legal action may be brought in any court of law to enforce the GNA
	6	If breach of conditions imposed by Financial terms 7 or 8 is found after above process, Unocal relieved of obligations
	7	Will jointly investigate an arbitration procedure for resolving conflicts, conducted by recognized neutral
	8	SEA shall withdraw its appeal of the LUP and any appeal of any other permit, approval, or condition
	9	SEA, CBE, and any other organizations will refrain from appealing the LUP or any other project-related permit
	10	Unocal will pursue its appeal regarding conditions of the LUP in a manner consistent with this GNA

GNA Section	Provision Number	Post-12/9 Proposals	12/12	12/16	12/18	12/19 (5:30 p.m.)	12/19 (11:00 p.m.)	Final
Health Risk and Medical Monitoring	1	NC	NC	NC	NC	NC	NC	NC
	2	Clinic wording introduced (+)	Changes accepted	Wording added; up to \$15k/month	SEA added	Further specification of clinic	Changes accepted	NC
	3	\$70,000 (+)	Change denied	\$100,000 (+)	\$100k kept; PI specified; If major release, provide early medical intervention (+) (new #3)	New #3 accepted; Study amount raised to \$238k; PI accepted	NC	NC
	4	Van (-); Medical facility (+)	Changes denied	NC	NC	Van now part of permit conditions	NC	NC
Emergency Response and Community Warning	1	NC	NC	NC	Expand availability	Date certain (+)	Change accepted	NC
	2	Community-based information system (+)	Change denied	NC	Working group for information system (+)	Changes accepted	Group specified and date certain (+)	NC
	3	-	-	Will fund siren in Crockett (+)	Siren purchase and use specified	Dates certain (+)	Change denied	NC
Vegetation and Parks	1	Tree maintenance program (+)	Changes denied	NC	Detailed vegetation plan; preference for seedlings; specify priority areas (+)	Changes accepted	NC	NC
	2	NC	NC	\$100k for path (+)	Change accepted; standards specified	Changes accepted	NC	NC
	3	NC	NC	NC	NC	NC	NC	NC
	4	-	\$5k for tree management district	NC	NC	NC	NC	NC
School Safety	1	Series of monitors (+)	Change denied	NC	NC	Slight wording change	Date certain (+)	NC
	2	Delete	Change denied	NC	Also to facilitate drills (+)	Linked to results of #3	Change accepted	NC
	3	Maintenance (+); date certain (+)	Changes denied	Up to \$500k for school risk mitigation (+)	Assessment specified; up to \$500k accepted	Report to be public	Change accepted; PI expertise specified	NC
	4	Date certain (+)	Change denied	NC	NC	NC	NC	NC
	5				Will consider bus turnaround at Hillcrest (+)	Change accepted; grant deed to property necessary	Change denied; will discuss possibility	NC

GNA Section	Provision Number	Post-12/9 Proposals	12/12	12/16	12/18	12/19 (5:30 p.m.)	12/19 (11:00 p.m.)	Final
Vocational Training	1	Matching funds (+)	Change denied	\$100k annual for vocational programs (+)	Change accepted	NC	NC	NC
	2	Hiring preference (+)	Change denied	Hiring preference (+)	NC	Program to be mutually agreeable	Change accepted	NC
	3	Include maintenance work (+)	Accepted	Outreach program specified	Broad outreach goals (+)	NC	At least one interview session per hiring campaign (+)	NC
Transportation	1	Trans Demand Management Program (+)	Accepted	NC	TDM goals dropped	Second location for patrol, TDM goals added	Changes accepted	NC
	2	Improvements within one mile of refinery (+)	Change denied	Projects to be prioritized according to community preference	Improvements within 1.5 miles (+); Cummings Skyway priority specified	"On routes of regional significance" (+)	Change accepted; Unocal to use Skyway as primary route for truck traffic	NC
	3	Avoid peak traffic w/ truck deliveries (+)	Change denied	Avoid peak traffic (+)	Replacement limited to bulk deliveries	NC	Will evaluate use of vehicle escorts (+)	NC
Environment	1	Dates certain; wording (+); delete part "g"	Changes denied	Dates certain (+); delete part "g"	Changes accepted; land use permit governs when documents conflict	Final design to County by Unocal; data to CAP, etc.	Changes accepted	NC
	2	Change to annual; dates certain (+)	Changes denied	Audit committee, data sharing specified	NC	Additional audit objectives (+); certain dates deleted	Dates added; audit scope specified; trade secrets to be available to contractor (+)	NC
	3	NC	NC	NC (now #4)	Deleted (redundant)	NC	NC	NC
	4	NC	NC	NC (now #5)	NC	Hydrogen sulfide explanation deleted	NC	NC
	5	Additional reductions from bellows valves (+)	Change denied	NC (now #6)	NC	First replacement changed to read "at earliest turnaround"	All projects changed to "or by earlier date as unit maintenance schedules allow"	NC
	6	Will not seek offsets for reductions (+)	Change denied	Will not seek offsets (+) (#7)	Language changed to "no emission reduction credits"	NC	NC	NC

GNA Section	Provision Number	Post-12/9 Proposals	12/12	12/16	12/18	12/19 (5:30 p.m.)	12/19 (11:00 p.m.)	Final
Financial	1	Raise to \$250k/yr.	Change denied	Raise to \$250k/yr.	Change accepted	NC	Raise to \$270k/yr.	Raise to \$300k/yr.
	2	Raise to \$125k/yr. each town	Change denied	Dropped	NC	NC	NC	NC
	3	\$50 from each fund set aside for voc. training	Change denied	\$100k for voc.; \$10k to Tormey; \$20k to Tree Management	\$50k for voc. from Unocal, 50k from above funds; 75k per town	NC	\$85k for each town	\$100k for each town
	4	NC	NC	Dropped	NC	NC	NC	NC
	5	NC	NC	Dropped	NC	NC	NC	NC
	6	NC	NC	NC (now #3)	NC	NC	NC	NC
	7	Restrict to no legal action	Change denied	NC (now #4)	Slight wording changes	NC	NC	NC
	8	NC	NC	NC (now #5)	NC	NC	NC	NC
	9	Unocal to support shared distribution of county tax allotment (+)	Change denied	NC (now #6); #7 added (shall support shared tax allotment	NC; #7 accepted	NC	NC	NC
Legal	1	NC	NC	#'s 1-4 consolidated	NC	NC	NC	NC
	2	NC	NC	NC	NC	NC	NC	NC
	3	Delete	Denied	NC	NC	NC	NC	NC
	4	SEA may bring legal action	Change denied	NC	Changed to "institution of proceedings" to revoke permit	Change accepted	NC	NC
	5	Enforceable in Superior Court, not ZA	Change denied	Deleted	NC	May bring action in any court of competent jurisdiction	Change accepted	NC
	6	Delete	Kept	NC (now #2)	NC	NC	If breach, Unocal entitled to damages	Change accepted
	7	No arbitration	Change denied	NC (now #3)	NC	NC	Deleted	NC
	8	Delete	Kept	NC (now #4)	NC	Parties' agreement to not appeal other RFP permits dropped	Change accepted; parties can challenge future LUP changes	Change accepted
	9	Unocal also refrains from appealing	Change denied	NC (now #5)	NC	NC	GNA part of LUP	Change accepted
	10	Delete; if portion deemed invalid, other portions remain valid (+)	Changes denied	NC (now #6)	NC; #7 added (other portions shall remain enforceable); #8 (parties to resolve inconsistencies w/ future LUP changes)	NC; #9 added (any successors to signatories agree to be bound to agreement)	NC	NC

Chapter 5

The Narrowing Influence of Parallel Processes: Clean Air Act Litigation in Swansea-Elyria

This chapter documents actions taken by federal and state agencies to address a series of incidents at a Conoco Petroleum Refinery, located less than two miles northeast of a working-class Latino community known as Swansea.⁴³⁴ These actions preconditioned a mediation process between residents, a statewide public interest firm, and Conoco that did not facilitate consideration of the full extent of community interests. Litigation that encouraged these mediation talks was filed by the Colorado Public Interest Research Group and local residents associated with a local organization, the Cross Community Coalition. The suit accused Conoco of violating the Clean Air Act by emitting sulfur dioxide and flaring certain gasses in excess of permit conditions, a practice which led to numerous odor complaints received by the state in 1996. Residents approached talks with Conoco with the a high level of commitment, organization, and inventiveness, proposing a sulfur dioxide inventory, a review of technology options for sulfur recovery, efforts to eliminate odor sources, and fence-line monitoring to protect residents from accidental releases. Administrative actions covered other important aspects of plant operations, including recently documented benzene releases that could potentially contaminate groundwater. This chapter shows how an industry, targeted by multiple regulators (federal, state, and citizen), can develop a proposal to simultaneously satisfy their demands while anticipating and adapting to changing environmental enforcement conditions. Here, Conoco's "Denver Refinery Sulfur Project Presentation" called for all regulators to accept the refinery's goals for emissions reductions and

technological improvements to its sulfur recovery operations, leaving only minimal funds to address more specific concerns of Swansea and Commerce City, host to the facility. The “predetermined” nature of the mediation process is explored by showing how parallel agency, corporate, and community activities shaped the timing and substance of a zone of possible agreement that was established prior to resident involvement and agreed to despite the absence of certain important interests.

Background. Environmental justice disputes add distinct layers to existing regulatory, corporate, and industry developments. Communities are increasingly able to maneuver through these realms and understand the extent to which each can contribute to or help resolve risks to resident health and well-being. Yet problems of judging whether behavioral changes by any given firm will yield noticeable improvements to quality of life at different geographic scales and dealing with this challenge within the context of multiple, overlapping, existing processes can limit the effectiveness of mediation in meeting a community’s interests. As the communities of Swansea entered into a mediation regarding air emissions, they were given little time to come to terms with these challenges.

The Conoco Petroleum Refinery,⁴³⁵ located 1.5 miles northeast of Swansea in nearby Commerce City, was not technically a neighbor, although many of the odor complaints received by the state were from the community.⁴³⁶ These complaints peaked in September, 1996 when a disruption in refinery operations resulted in flaring that contained substantial amounts of sulfur dioxide (SO₂).⁴³⁷ Conoco would later be accused of violating the Federal Clean Air Act by emitting sulfur dioxide and other compounds (potentially in excess of permit limits) and flaring certain gasses in violation of permit

conditions.⁴³⁸ Litigation was initiated by the Colorado Public Interest Research Group (COPIRG), who had been active in passing the Colorado Clean Air Act in 1992.⁴³⁹ The CO CAA required industries to more fully disclose their annual emissions through use of Air Pollution Emission Notices (APEN's)⁴⁴⁰, which went above and beyond the EPA's Toxics Release Inventory and gave COPIRG and public interest attorneys a clear suspicion that Conoco was illegally venting sulfur dioxide. The Swansea community became involved as joint plaintiffs with COPIRG on a citizen suit under the CAA.

Sulfur Emissions Concerns. COPIRG, an experienced public advocacy organization, had begun to look at stationary sources of air pollution across the state in 1990.⁴⁴¹ They conducted an early assessment of the CAA as it was federally reauthorized in 1990, determining what percentage of emitting sources would be cut through federal statutes. Conoco appeared in the early 1990's in their analyses of the Denver metropolitan area as one of the major sources of air pollution, particularly criteria air pollutants.⁴⁴² At the time, its emissions were dwarfed by those of power plants such as Excel.⁴⁴³ COPIRG worked with Environmental Defense and the Land and Water Fund of the Rockies to reach a voluntary agreement with Excel where the company would receive tax credits for pollution control equipment. This left oil refineries as the largest source of sulfur dioxide and nitrogen oxide emissions in the greater Denver area.

An attorney at the Land and Water Fund of the Rockies, based in Boulder, CO, was also investigating the refinery's activities.⁴⁴⁴ His research, based in large part on a review of public documents such as facility permits, focused on the refinery's sulfur recovery operations.

Conoco had two different pollution control devices, #1 and #2. And the refinery according to Conoco needs to operate 24 hours a day, 365 days a year, and yet those pollution control devices need to be shut down for maintenance periodically and sometimes it's for a long period of time.

So you would think that OK, it's a redundant system. If you shut down one, then you reroute all the gasses through the second one and when you shut down two you reroute all the gasses through one. For some reason, whether it was one of the devices took liquid as opposed to gas, when they shut down one of these they could not reroute the gasses to the other one, so instead they routed the gasses to a central flare. Now central flaring is something that all refineries have the ability to do for emergency situations but it's a terrible form of releasing. Because flaring doesn't have any pollution control capturing. So you're venting the worst of the worst. So there was significant flaring going on at Conoco when they'd shut the facility.⁴⁴⁵

This problem substantially impacted the refinery's sulfur emissions. Specifically, the Conoco refinery contained two units (sulfur recovery units, or SRU's) where a catalyst is used to break hydrogen sulfide (which is formed when sulfur is removed from crude oil) into elemental sulfur which then solidifies and can be sold. Not all hydrogen sulfide is converted. Some is sent to a "tail gas incinerator" and either flared or burned. This results in a release of sulfur dioxide into the atmosphere during normal operations. Conoco was issued a permit in 1991 to construct and operate a second SRU in order to handle acid gas from a new Gas Oil Hydrodesulfurizer (GOHDS) as well as sour water stripping derivatives.⁴⁴⁶ This structural change was part of a larger project to produce low sulfur diesel fuel.⁴⁴⁷ The unit experienced operational difficulties, including a period in April 1996 where it was shut down for 20 days. When the SRU shut down, a gas stream was sent to a flare where it generated SO₂. Venting SO₂ into the atmosphere posed a nuisance and potential health problems to neighboring communities.

Conoco's SRU #2 permit limited the emissions of SO₂ to 85 tons per year and 19.6 pounds per hour, and required "all gas from the sour water stripper shall be processed through the Claus sulfur recovery unit."⁴⁴⁸ During maintenance, however, Conoco would shut down its GOHDS while continuing to operate. This would continue to generate a sour water stripper gas stream (containing an estimated 5 tons/day of SO₂) that would be sent to a flare and vented into the atmosphere.⁴⁴⁹ The attorney documented

the following incidents of SRU#2 shutdowns and sour water stripper flarings between July 1995 and July 1996 as part of his preliminary analysis:

Table 11. Potential Permit Violations between July 1995 and 1996, Conoco Refinery.⁴⁵⁰

Incident Start Date	Duration (hrs.)	Lbs./hour SO2 release (est.)	Total SO2 Released (tons)
October 25, 1995	46.25	416.67	9.64
December 10, 1995	12.08	416.67	2.52
December 20, 1995	7	416.67	1.46
January 9, 1996	16.58	416.67	3.45
January 21, 1996	7.5	416.67	1.56
January 31, 1996	3.86	416.67	0.80
February 23, 1996	7.4	416.67	1.54
March 21, 1996	.4	173.6	0.03
March 23, 1996	11	416.67	2.29
April 1, 1996	5	416.67	1.04
April 3, 1996	.5	208.34	0.05
April 7, 1996	545	416.67	113.54
May 14, 1996	457.75	416.67	95.37
June 1, 1996	.91	381.9	0.17
June 14, 1996	.3	125	0.02
June 26, 1996	.38	159.7	0.03

COPIRG joined with the Land and Water Fund attorney to investigate a possible suit under the state and federal Clean Air Acts. They also sought out members of the affected community:

We were aware of the concerns going on simultaneously about large numbers of companies operating in that area so we made contact with the director of the CCC and spoke with her about this issue and brought her in to the information that we had access to as well as the president of the local neighborhood association. So we, they had expressed some concern, there was some information in the file about concerns, basically neighbors smelling, I mean the oil refineries aren't particularly sweet smelling to begin with, but the residents were reporting that there were occasionally very nasty smells coming from the neighborhood, and we began to put two and two together that these were probably the occurrences of when there was large-scale venting occurring.⁴⁵¹

By 1996, residents sensed that certain refinery emissions were increasing substantially from the norm, although they were not aware of the underlying causes:

We didn't know what was going on over there, but we would readily complain because a lot of times when we would see that big flame at night or during the day and at the same time you would

start getting the smells from the refinery. And you would smell it heavily in the neighborhood. And so we were complaining about a lot of that stuff at the time just like we had constantly been complaining for years and years and years about the rendering plant. Some days you don't even notice it, but then in the summer times or when the wind's just right it'll gank you, I mean it's a foul, foul smell. It's not unheard of somebody getting a whiff of that and starting to vomit.⁴⁵²

As COPIRG, the attorney, and local residents developed an understanding of Conoco's violations, broader regulatory developments began to shape how they would eventually resolve a dispute over SO₂ emissions. Federal environmental statutes such as the Clean Air Act contain provisions that allow the EPA to place parts of the programs under state control.⁴⁵³ This allows the EPA to avoid running programs in all 50 states, a task for which it lacks the necessary resources.⁴⁵⁴ In the mid-90's, the Colorado Department of Public Health and Environment worked on meeting EPA delegation requirements, and the federal EPA began to promulgate monitoring, reporting, and enforcement requirements for state implementation (which, in the opinion of COPIRG yielded a more collaborative Notice of Violation policy given the CDPHE's agency culture).⁴⁵⁵ By 1998, the state of Colorado was given interim approval for delegation of the EPA's permitting authorities.⁴⁵⁶ The issue of delegated environmental enforcement is closely linked to Colorado's comparatively strong self-audit policy enacted by the state legislature in 1997.⁴⁵⁷ The self-audit policy in Colorado allows "a privilege for self-critical analysis done in a voluntary self-evaluation of a [company's] environmental compliance."⁴⁵⁸ The Colorado state legislature, when enacting this legislation, stated:

The general assembly hereby finds and declares that protection of the environment is enhanced by the public's voluntary compliance with environmental laws and that the public will benefit from incentives to identify and remedy environmental compliance issues. It is further declared that limited expansion of the protection against disclosure will encourage such voluntary compliance and improve environmental quality and that the voluntary provisions of this act will not inhibit the exercise of the regulatory authority of those entrusted with protecting our environment.⁴⁵⁹

Colorado's statutory privilege for environmental self-evaluation was passed in response to a 1993 case involving Coors Brewing Company, which was fined over \$1 million by the Colorado Department of Health after disclosing volatile organic compound emissions.⁴⁶⁰ The company was not required to disclose the information, and had learned of the emissions through its own voluntary study. The state statute went beyond mere privilege and relaxed requirements that reporting entities use prompt remediation of any contamination that they discovered.

The EPA and the Department of Justice have actively opposed the self-audit policy and expressed the opinion that Colorado can no longer meet delegation requirements because of it. One of the mechanisms for the EPA to retain its authority over delegated powers, overfiling, was carried out as part of the EPA's attempt to compensate for the state's lack of sufficient use of its enforcement powers. Overfiling occurs when the EPA begins an enforcement action regarding a program that has been delegated to a state.⁴⁶¹ Residents' concerns over Conoco's sulfur emissions would be resolved in large part through the settlement of an EPA overfiling.

Contours of the Sulfur Emissions Dispute. The citizen suit against Conoco, and the mediation process that followed, was shaped in large part by processes beyond plaintiffs' control. Before COPIRG and Swansea residents filed a citizen suit, EPA Region VIII and the CDPHE stepped in, initiating what the former President of COPIRG would refer to as "four games of chess" that were played and solved nearly simultaneously among federal, state, and local interests:

1. EPA Region VIII overfiled on previous CDPHE enforcement actions on March 18, 1997, claiming that in a previous consent order between the state and Conoco the state did not adequately interpret regulations concerning inspections, record-keeping, hazardous waste discharges, notices to the state, and penalties associated with certain counts of RCRA violations;⁴⁶²

2. The state filed Compliance Advisories under RCRA and the Colorado Hazardous Waste Act, regarding the presence of benzene in one of Conoco's wells and the contamination of groundwater.⁴⁶³ It also continued to work with Conoco on adjustments to its construction permits;
3. COPIRG and local residents filed a citizen's suit under Section 304 of the Clean Air Act, focusing on the fact that Conoco had failed to detect violations for five years as it had not properly monitored its SO₂ emissions;⁴⁶⁴ and
4. Conoco continued to adapt to a series of regulatory and site-specific changes, while working with the CDPHE to ensure that its operations were in line with permit specifications. The company stopped producing leaded gas at its Commerce refinery in 1990, sought, announced, and then scrapped a proposed joint venture with the Colorado Refinery Company to share the costs of complying with more stringent environmental controls (requiring .05% sulfur diesel fuel by October 1993), addressed the reengineering of a device (the grubbs manifold) that caused the death of a worker who was cleaning a reactor in the hydrosulfurization unit, and faced budgetary limits to expenditures for on-site continuous emissions monitoring and sought to improve their control over fugitive emissions, two areas of concern that would be addressed in subsequent consent orders with the Justice Department.

Table 12 (see appendix) illustrates the progression of each of the above legal and organizational developments.

EPA's RCRA overfiling was both a part of its response to the state's audit privilege law and a result of EPA Region VIII's longstanding attempt to work with the state to enforce hazardous waste regulations. The EPA and the state engaged in joint inspections of the refinery in March and April of 1992. The state cited violations found during the inspection in a Compliance Order against Conoco. The Order required compliance within 45 days and required actions similar to what the state had called for in 1985. In December 1995, another inspection took place, unearthing violations that mirrored those found in 1985 and 1992. The Complaint lodged in 1997 amounted to a sprawling list of violations, from faulty recordkeeping to storage and disposal without a permit. The Complaint prompted Conoco to file two motions for accelerated decision, claiming that in their rush to undermine the state's statutory authority the EPA failed to take a proper inventory of Conoco's inspection records.⁴⁶⁵

While the CDPHE was arguably sub-par in its enforcement of certain RCRA violations, it was actively involved in discussing whether the refinery was required to include “routine maintenance” in its APEN emissions estimates. Conoco claimed that process unit turnarounds, which resulted in substantial increases in SO₂ emissions, were not distinct from start-ups, shutdowns, and malfunctions and should not be included.⁴⁶⁶ In August, 1996, CDPHE requested that Conoco provide the Air Pollution Control Division a record of all incidents where acid gas or sour water stripper offgas was combusted in the main flare since June, 1993. The information was requested in 12 month segments, suggesting the agency was investigating when permitted levels were exceeded.⁴⁶⁷ The CDPHE was also actively engaged in a separate RCRA action regarding hazardous substances and waste material found to be migrating from the facility into groundwater and nearby creeks and wells. Compliance Advisories were issued to Conoco in February and August, 1997.⁴⁶⁸ Both the EPA Region VIII and CDPHE were in the process of resolving Compliance Advisories with Conoco when citizens filed suit under the Clean Air Act.

The citizen suit was brought under the Federal Clean Air Act for Conoco’s alleged sulfur dioxide emissions.⁴⁶⁹ The problem, according to the original complaint, began when Conoco installed a second SRU. The unit malfunctioned on numerous occasions, causing Conoco to perform maintenance while diverting gas to its main flare. In addition to alleged violations of permit emissions requirements, plaintiffs alleged that continuous monitoring and recording of concentrations of sulfur dioxide discharged into the atmosphere was not taking place. Conoco’s lack of a continuous monitoring instrument was one of three causes of action for the citizen suit (the final being Conoco’s

failure to process all gas from the sour water stripper in the SRU). Relief sought included declaratory judgment, a compliance order (that would include monitoring), penalties of \$27,500 per day for each violation under the CAA, and \$100,000 for beneficial mitigation projects. The community representatives involved in the case focused on particularized impacts to local residents and the need for monitoring and resident notification, while the state-wide organization sought precedent-setting results at the level of construction permitting.

Conoco's Response. Conoco adapted to each of the above developments through the efforts of managers, engineers, and environmental professionals.⁴⁷⁰ In general, Conoco responds to new corporate objectives, pollution control challenges, or regulatory or permit changes through adjustments in two directions. First, new objectives were tied to specific roles and personnel from upper management through various incentives. Second, middle management used data in what is called the “plant management system” to track emissions points (85 in all), respond to “upticks” and regulatory exceedances, carry out trend, incident, and root cause analyses, and propose changes that accounted for budgetary constraints, systems effects, and broader plant optimization goals. The two directions often intersect, particularly within a given refinery’s various emissions programs (i.e., Air Program) and broader Environment, Health, and Safety management. These streams of adjustment, adaptation, and innovation were in motion long before the filing of *COPIRG v. Conoco*.

Since 1990, environmental managers at the refinery had been working on nine environmental initiatives instituted by Conoco upper management, including a pledge to reduce toxic air emissions and hazardous solid waste significantly beyond existing legal

requirements. Efforts to adapt to such objectives are limited by whatever information is available and the ability to process and interpret the data. For example, sulfur, which is allowed in finished products in varying (and over time decreasing) amounts, is not uniformly monitored at the refinery, as a patchwork of regulations guide the facility's tracking of various chemicals:

Environmental regulations apply to specific pieces of equipment, so if your piece of equipment is covered by a specific regulation that requires a certain kind of monitoring that's what you do. So, for example, I talked about the heaters and boilers we have, and there's a requirement that the fuel that you burn, if you think of them as big gas stoves almost, not to be too simplified, but if you think about it, we've got dozens of big gas stoves all over the place, we have one monitor that measures the hydrogen sulfide in that gas that goes to every burner, and that's a continuous emission monitor. And we have requirements on the limit of hydrogen sulfide we can have in that monitor, or have in that gas in any period of time. So we get a continuous readout. If the monitor fails for some reason, then we have to take other samples and get other readings so that even if the monitor is not working we have to prove that we stayed in compliance. And then we have a continuous emission monitor, when I mentioned earlier all of the changes we had to make in the early 1990's to get the sulfur out, we put in a process that helps us process the sulfur, and it has a continuous emission monitor for our sulfur dioxide concentration in that. The rest of our facility now, because we haven't made the kind of changes that require the emissions monitors, we use what are called AP-42 factors. The EPA has said if you process this much crude oil through a certain kind of unit, this is the factor you use to estimate your emissions.⁴⁷¹

It depends on the units involved. There's multiple places where we have sulfur dioxide emissions. There's one that has a continuous monitor on it. There's one that's not yet been required. We have two sulfur recovery units. One of those is continuously monitored right now. The other one which is an older one had not triggered the requirement to do so, but under the national consent decrees [lodged after the settlement of *COPIRG v. Conoco*] will. And it will have a continuous monitor on that. And there are other sulfur dioxide sources in the plant as well. And some are monitored more frequently, some less, a lot of that dependent on regulatory requirements.⁴⁷²

Monitoring other sources of environmental contamination, such as particulate matter and fugitive emissions and flaring, poses completely different sets of challenges. For each of these areas of emissions, environmental managers work in teams (such as the Reliability Group and the Refinery Leadership Team) to (a) stay within permit requirements, (b) avoid upsets and reduce the unplanned release of certain chemicals, and (c) increase plant efficiency. Given the fact that the refinery process is continuous throughout the year, crude oil and its various toxicants and impurities are flowing through the system every hour of every day. Uncontrolled or unplanned releases, resulting because of electrical or

system component failure, can account for a significant percentage of overall emissions. An upset that lasts 10-20 minutes, where certain streams are sent to a flare to avoid overpressuring vessels or spilling hazardous chemicals, can yield more emissions than normal operations for 1-2 days. Routine maintenance factors strongly in attempts to achieve reliability and emissions reductions. A weekly incident review process involves a formal management review of incidents and in the case of large-scale incidents a root cause failure analyses. Under the recent consent decree between Conoco and the Department of Justice, the facility must comply with strict guidelines for when to trigger a root cause failure analysis (for example, releases of more than 500 lbs/day of sulfur dioxide).⁴⁷³

Communicating what is learned through failure analysis, and assigning new roles or incentives to engineering groups, operators (who work on four separate shifts under contract), mechanical personnel, and planners who determine how the facility should be run is a challenging task. Equally daunting is the need to target cost-effectiveness across the universe of a facility's boilers, valves, pumps, flanges, and other pieces of equipment, estimate the effects of any changes on the system as a whole, and propose changes that will remain within projected budget allocations or convince upper management of their need.

The process engineers are kind of the ones sitting out there saying how can I run this unit better? What can we do that can create an advantage for us someplace? And so they're by nature looking out ahead and I think that's the guys who can do that. And the other one here probably who has a really good long-term and kind of how does it all fit together is the optimization leader... The barrier is getting projects to be viewed as cost-effective and that might not be at the site level, it may be at a higher level than that. I mean there's people look at a project, and as a company you've gotta make money. And so that ultimately sits out there behind things, and people have always struggled with the concept of does an environmental project make money and I actually think that there's more acceptance now that they do. But the payback's different than what the people are normally used to looking for. It might be indirect. Traditionally, from an engineering perspective, people would look at a project and they'd say if we do this then we can produce x amount more gasoline and that means we make that much money, so you compare that to the original cost of the project and you can say yeah, this is justified. And the environmental projects

don't have the same direct payback to them. Sometimes they are cost-avoidance: if you do this you won't get a penalty. Sometimes, and then there's the grey, it's really hard to quantify community acceptance.⁴⁷⁴

The challenges of cost-effectiveness, mining and interpreting thousands of data points, coordinating among diverse work groups, operators, engineers, and upper management, and communicating new goals and tasks to over 200 employees on-site are indeed daunting. At the same time, they offer opportunities for those seeking to enforce the permits and regulations that drive much of the refinery's environmental management work. Indeed, the fact that citizen concerns over SO₂ emissions could be resolved by finding a practical or engineering solution rather than a legal finding of fact encouraged settlement discussions in the first place. But once discussions commenced around Conoco's proposed solutions to SO₂ emissions, there is little evidence that the mediation process offered a full appreciation of how plaintiffs could shape discussions around Conoco's *broader* attempts to address sulfur emissions in order to address the company's environmental management challenges.

Nor was it clear that EPA Region VIII, the Justice Department (involved in settlement negotiations with a significant percentage of the nation's refinery operations at the time), or plaintiffs had figured out an appropriate division of labor to maximize Conoco's promised reductions in emissions more broadly. Lacking broader coordination among these groups, Conoco developed a response to EPA's RCRA action that served as the primary driver behind the mediated resolution of the citizen suit.

As indicated in Table 12, the citizen suit was filed after the RCRA actions were commenced by EPA Region VIII and CDPHE. Plaintiffs gave notice of violations in the citizen suit on November 3, 1997.⁴⁷⁵ EPA Region VIII and Conoco had been engaged in

an alternative dispute resolution process facilitated by an administrative law judge since June 30th 1997.⁴⁷⁶ By September 2nd, the parties to the EPA RCRA action reportedly had “developed some reasonable possibilities for settlement that remain to be explored.”⁴⁷⁷ The parties’ tone changed a month later, when they recommended termination of the ADR process.⁴⁷⁸ Two weeks after plaintiffs in *COPIRG et al. v. Conoco* gave notice of their intent to sue, Region VIII and Conoco made a joint request for a stay of litigation.⁴⁷⁹ Parties believe that it is at this point that Conoco began to contemplate and design a settlement that would satisfy the demands of Region VIII, COPIRG, residents, and the CDPHE as expressed in the RCRA action, the citizen suit, and state activities such as discussions over permitting of the #2 SRU (see Table 12). Court records confirm that two months after a stay was granted for the RCRA matter, parties began to reach a “settlement in principle” that included a supplemental environmental project (SEP), the magnitude of which “may impact other issues currently being discussed by the parties outside the context of this matter.”⁴⁸⁰

Less than a month following the RCRA “settlement in principle,” parties to *COPIRG v. Conoco* began to meet under the direction of a mediator to consider the “Conoco Denver Refinery Sulfur Project Presentation.”⁴⁸¹ Importantly, parties to the EPA RCRA action had to request motions for extension of time, and were given several deadlines for submitting an executed Consent Agreement to the court.⁴⁸² Parties to the citizen suit, particularly resident-plaintiffs, thus entered settlement negotiations *after* Conoco had begun to try to link settlements in the two cases and the court had set tight deadlines relevant to such linkage. Conoco would ultimately resolve the above two

actions as well as CDPHE's RCRA action over groundwater contamination with essentially the same Supplemental Environmental Project.

Pre-Mediation. The district court hearing *COPIRG v. Conoco* tried to order the parties to attempt settlement negotiations in January, 1998 (the judge ordered the scheduling of a settlement conference to be presided over by a magistrate judge in early February). Parties did not seem particularly interested in following the judge's timeline (they filed a joint motion to vacate the judge's scheduling orders), and instead continued discussions with a mediator they had selected jointly.⁴⁸³ Conoco had already begun to focus on an overarching settlement to cover the citizen suit and RCRA action. Plaintiffs to the citizen suit, on the other hand, entered negotiations in order to gain *assurances* of reduced flaring and emissions, *understanding* of the risks associated with sulfur dioxide and other chemicals released, and the ability to *educate* other residents of impacted communities of the risks posed by the facility:

We came in with an agenda that we had, that we are the victims of what's going on over here and it needs to be fixed not because of your profits or not because of anything else but that we're overburdened, and that's been our story over here is that we are the center of everything and we're overburdened by everything from all across the city. People drive into the city to work, we get the fumes from their cars. They need more highways, they come right through our neighborhood. The trains, people want to move downtown, they need a place to switch the trains and store the trains, we get them in our backyard. I think COPIRG stuck pretty much to their stuff and we jumped on them for things that we needed. We needed the assurance that the flare-ups wouldn't keep going up, we wanted an understanding of what was being released in all of those releases, we wanted an understanding of what the health effects would be from the things that we were breathing from that area, and that just the assurances that those would be reduced or stopped.⁴⁸⁴

One of the mediator's tasks was to justify representation of all interests that could either influence or be affected by the outcome of any settlement of *COPIRG v. Conoco*.

Assuming the alleged violations true, the mediator assessed whether plaintiffs' interests, if obtained, would benefit "others that were similarly situated" or part of the same class.⁴⁸⁵ Because the mediator could not identify any proposed solutions to sulfur

emissions that could prove detrimental of the broader community if implemented, he chose not to broaden the mediated discussions beyond the parties to the suit. The mediator was responsible for trying to align the interests of the plaintiffs, whose interests did not entirely overlap as they commenced discussions with a company that was already in the process of justifying proposed process changes to the EPA Region VIII. Table 13 provides the premediation elements of *COPIRG v. Conoco*.

Table 13. *COPIRG v. Conoco* Mediation Elements: Pre-Mediation.

Element	Residents	COPIRG	Conoco	Mediator
Initiation	Informed of discussions between COPIRG and Conoco that had led to desire to reach settlement	Agreed to attempt to reach settlement	Agreed to attempt to reach settlement	Contacted by counsel for plaintiffs and senior counsel for Conoco
Assessment	Limited; approached the mediation prepared to learn about sulfur recovery and flaring operations	Extensive research of Conoco's emissions; comparative knowledge of emissions for Denver area, region; contacted petrochemical operations expert in CA	Series of discussions with EPA Region VIII regarding settlement of RCRA action; internal consideration of process changes necessary to meet projected regulatory changes; formulation of Sulfur Project Presentation.	Discussions with parties; discuss and agree to responsibilities of parties to mediation; interviews to discern consistency of issues and appropriateness for mediation discussion; assessed willingness to reach agreement
Representation	President of CCC; President of United Swansea (counsel – same as COPIRG)	Colorado Public Interest Research Group President, counsel	Plant manager; senior counsel, and environmental manager	Environmental attorney hired jointly by parties

Rationale for Representation	Experience with mediation; substantial knowledge of environmental concerns of neighboring communities	History of advocacy for clean air legislation; involved in passage of CO CAA and proponent of the APEN system; represented statewide and air basin interests	Persons with greatest knowledge of plant operations and challenges, including sulfur recovery; experienced counsel with knowledge of RCRA action with EPA Region VIII	Experience working with Conoco and Land and Water Fund; knowledge of both sides' concerns; extensive experience mediating environmental disputes and understanding of legal issues
Objectives	Convince Conoco to make necessary changes to reduce their sulfur dioxide emissions; wanted to improve Conoco's practices, not their image; wanted assurance that flare-ups wouldn't continue; understanding of what was being released; build relationships; pursue monitoring technologies for advanced warning of releases; set precedent for other community-corporate relations	Focus attention on serious environmental concern; take away economic incentive for Conoco to violate the laws in question; include a financial component that would go toward broader environmental benefits; settlement goes to a third party (not spent by the company or COPIRG); set precedent for other statewide litigation	First phase of meetings: demonstrate that Conoco is operating within parameters of relevant permits Second phase: determine how interests of plaintiffs could be build into a settlement that also addresses the RCRA action; work with community on an environmental project; develop more productive relations; improve efficiency/legitimacy of refinery operations; be viewed as a good citizen	Help parties reach settlement that addresses their underlying interests

Actions against Conoco were described as “lawyer-generated,” fueled by attorneys with conflicting objectives. Attorneys for the EPA monitored state implementation of its delegation requirements under the Clean Air Act. Attorneys for CDPHE monitored Permit 10AD998, issued to Conoco for its Claus Sulfur Recovery Unit. Both agencies notified Conoco starting in 1991 that significant hydrocarbon seepage into Sand Creek had been observed. Both conducted inspections of Conoco for RCRA compliance, noting a series of violations. Then, EPA Region VIII overfiled on the state’s enforcement

actions, stepping up the pressure on CDPHE to enforce its hazardous waste program. Attorneys for COPIRG entered the fray with a citizen suit that focused on Conoco's failure to detect Clean Air Act violations for five years due to inadequate sulfur dioxide monitoring. Their goal was to set a precedent for regional industries and to build on legislative victories that had enacted the CO CAA and APEN.

By this time, Conoco and the EPA had reached a settlement in principle to Region VIII's overfile. Both parties filed a motion for an extension of time to consider a possible settlement to include a sum of money in addition to a SEP. Only after these actions had occurred did residents, who had filed numerous odor complaints during a two year period, finally join a statewide public interest firm in lodging their complaint under Section 304 of the Clean Air Act. The resident-plaintiffs had access to legal counsel and technical assistance, substantial prior experience with negotiation procedures, and a high level of community organization. They were in favor of moving toward mediation as soon as conditions surrounding the legal case warranted. In addition, residents shared objectives that could not be obtained through litigation, including joint exploration of methods to eliminate possible odor sources, on-site monitoring, and the hiring of a community technical consultant to conduct a review of technology options for SRU upgrades and evaluate engineering work performed by Conoco. Above all, residents wanted assurances that heavy flaring would not continue, and a notification system in case it did. Yet as we will see, parallel administrative actions encouraged a near exclusive focus on the sulfur recovery problem. In addition, an engineer who offered technical assistance to residents was contracted to review Conoco proposals rather than to explore broader production process changes that may be of interest to residents. And time constraints

imposed by parallel processes called for swift resolution of the citizen suit, so as not to jeopardize settlement of the EPA overfile.

Mediation. The mediation commenced with a meeting at the refinery where parties considered a presentation of Conoco's proposed sulfur project. In addition to proposed structural changes, the presentation included a "Pollution Prevention Progress Report" outlining the refinery's goals for emissions reductions: 5% per year for TRI, criteria air (including sulfur), and hazardous waste emissions, using 1993 as a base year. Also listed as facility-wide goals were the improvement of energy utilization and reliability, documentation of operating standards, enhanced environmental training for all employees, clear roles and accountability for employees, and improved emergency preparedness.

Formally, the mediation began less than a month later (March 10, 1998), at a preliminary meeting where parties discussed (a) an agenda, (b) the objectives of the mediation, (c) groundrules for the process, (d) a timeframe for completion, and (e) the factual background of the controversy.⁴⁸⁶ The scope of settlement discussions was limited to the factual background and violations alleged, actions that Conoco could take to resolve the alleged violations, and the drafting of a settlement that would codify actions required of Conoco and the plaintiffs for resolving the issues at hand.⁴⁸⁷ The timeframe, established during the next meeting, was surprisingly short (3-4 meetings over a span of weeks) for discussion of refinery process changes and broad community- and state-wide concerns. Within the context of the "four games of chess," it is possible to see why the timeframe had to be condensed.

Mediation progressed through a combination of shuttle diplomacy and face-to-face meetings between the parties, including COPIRG, resident-plaintiffs, plaintiffs' counsel, the refinery's plant and environmental managers, senior counsel, and other attorneys (some outside counsel). An additional party, a scientist with experience in refinery emissions who worked for an environmental organization in California, joined via telephone for at least one meeting. Her role was to ensure that proposed alternatives were feasible and would meet plaintiffs' objective of reducing sulfur emissions. Plaintiffs' attorney admits that the case lacked the *value* necessary for bringing in more experts to consider other options (value in terms of the potential for success at trial). Nonetheless, their hired expert was adept at evaluating Conoco and offered a buffer for the plaintiffs as they discussed refinery operations under conditions of uneven information.

The first meeting after preliminary discussions took place in the mediator's offices on March 31st.⁴⁸⁸ The meeting's agenda, drafted by the mediator, included (a) a presentation by Conoco, (b) a discussion of a proposed SEP, (c) summary of the preliminary meeting, (d) possible approaches to the EPA, (e) steps to address the court's schedule, and (f) scheduling issues.⁴⁸⁹ Conoco's environmental manager began the session with a presentation of the refinery's efforts to reduce sulfur emissions, using an aerial photograph of the refinery as a backdrop. Sources of sulfur dioxide and sour water, fate and transport, historic emissions, odor dynamics, and other aspects of the broader problem were presented. The mediator, an experienced environmental attorney, modeled the discussions after the National Environmental Policy Act's scoping process, where

project alternatives are scoped and then compared in terms of their environmental and economic impact.

Plaintiffs relied almost entirely on Conoco's information, much of which had been promised at the preliminary meeting and shared at the first session, in order to evaluate Conoco's proposals. Information sharing was followed by a discussion of whether the settlement discussions could result in a SEP that would resolve EPA Region VIII's RCRA action. There were concerns that such an arrangement wouldn't work, that plaintiffs would still require a consent order for any settlement with them, that an EPA global settlement with Conoco refineries could negate elements of the SEP that parties were working toward, and that EPA would require a permit modification that could delay resolution of the citizen suit because it would require extensive emissions modeling and public comment. Parties agreed to work toward an interim agreement during the next meeting and to put aside these broader issues. Conoco's involvement with EPA in active litigation restricted their ability to collect additional information requested by plaintiffs for the next meeting (such as an inventory of sulfur and other compounds emitted by the facility).

Between the first and second meetings, plaintiffs met with the mediator to discuss desired components of an interim agreement.⁴⁹⁰ Here, the community's sense of what an agreement should include was made clear. It is instructive to compare these elements with an interim agreement that was developed at the next mediation session, held on April 20th:

Table 14. Comparison of Plaintiffs' Desired and Actual Components of Interim Agreement.

Plaintiffs' Elements (April 7, 1998)	Interim Agreement Elements (April 20, 1998)
Conoco to provide SO2 inventory for the refinery	NOT INCLUDED
<p>Conoco to provide \$5,000 to COPIRG to hire a technical consultant to participate in development of a SEP; consultant would:</p> <ul style="list-style-type: none"> a. Conduct a literature review of technology options for SRU upgrades b. Evaluate the engineering work performed by Conoco concerning the preferred option for an SRU upgrade 	NOT INCLUDED
<p>Conoco to support a community educational program for the Swansea, Elyria, and Globeville neighborhoods that would be conducted over one year and include:</p> <ul style="list-style-type: none"> a. Information and briefing concerning efforts to minimize or eliminate to the extent possible odor sources in the area b. A one-time performance of a simple air quality dispersion model to illustrate how emissions are dispersed under different meteorological conditions c. A briefing about on-site monitoring that is performed by Conoco to protect employees and the possibility of fence-line monitoring to protect the community 	<p>Conoco to specify the anticipated design and development schedule for any engineering studies or other efforts underway or planned to reduce emissions related to this action at the refinery (adherence to this schedule will not be subject of a breach claim)</p> <p>Conoco to keep plaintiffs informed on a regular basis of efforts or development work to reduce emissions related to this action through an information exchange process designed and facilitated by the mediator</p> <p>Conoco to provide all relevant information regarding current or planned efforts to reduce emissions related to this action as soon as practicable after information is available or after submission of such to EPA or the State of Colorado</p>
<p>Conoco to fund a Community Right-to-Know project in a lump sum of \$72,000. Project designed to collect information about emissions in the community and to evaluate options to reduce such emissions. May include air quality modeling, monitoring, and technical assessments by consultants hired by plaintiffs. Plaintiffs to use scientifically recognized methods and protocols to ensure accurate information. Agree not to use funds for adversarial proceedings or for directly targeting Conoco's facilities</p>	<p>Conoco to fund a Community Right-to-Know project in a lump sum of \$72,000. Project designed to collect information about emissions in the community and to evaluate options to reduce such emissions. May include air quality modeling, monitoring, and technical assessments by consultants hired by plaintiffs. Plaintiffs to use scientifically recognized methods and protocols to ensure accurate information. Agree not to use funds for adversarial proceedings or for directly targeting Conoco's facilities</p>
Conoco to invite the Swansea, Elyria, and Globeville communities to participate as a member of the Industrial Council	SAME, with option for parties to determine that a different or new forum would be more appropriate than the Council
Conoco to establish a performance measure (reduction of SO2 emissions by a certain tonnage per year) for the SEP as determined by the evaluation process	Parties agree that the Agreement is directed toward significantly reducing emissions in the community including SO2 and other pollutants that cause odors

	Conoco to withdraw request to State for modification of existing permit related to turnaround emissions
	Any press releases or public information related to this action shall be jointly issued
	Plaintiff agrees not to encourage the EPA or State of CO to prosecute a civil action in court related to the subject matter of this action
	Plaintiff agrees not to review automatic disclosure materials until May 4, 1998
Plaintiff to dismiss civil action without prejudice	SAME, although a Second Settlement Agreement to be executed by Conoco would require dismissal <i>with</i> prejudice
Conoco to pay plaintiff's costs and attorney's fees	SAME, with amount stipulated

The above interim agreement accomplished several things: it maintained a certain level of ambiguity around the process and extent of sulfur dioxide emissions reductions, it transferred some of the monitoring, modeling, and emissions investigatory work from the company to the plaintiffs, and it included stipulations that served to shield the company from further liability. It also de-linked the establishment of a performance measure (SO₂ emissions reductions) from any community-driven evaluation process, for which plaintiffs had advocated. Thus, the interim agreement gave Conoco a level of flexibility that was necessary to pursue negotiations with EPA Region VIII, which by this time began to focus on an SO₂ emissions reduction SEP.

It was challenging for the parties to reach a point where they could engage in creative problem solving. As the interim agreement suggests, progress in this regard was slow at first. Yet at some point, either at the second meeting or at future sessions designed to finalize settlement documents, the parties began to focus on some of the specific elements of the production process. Plaintiffs credit the plant manager for showing a level of patience in explaining how production was related to sulfur emissions.

While Conoco's attorneys sought to limit his sharing of information, plaintiffs were given an opportunity to evaluate what they were being shown:

Then we were really clear that they needed to replace sour water stripper number one. It was ancient, it was frequently down, it wasn't able to process as much as the second one. And so what had happened is since this area was declared an economic enterprise zone, then well you know all the tax breaks and stuff, so Conoco had literally quadrupled in size. But it had not necessarily kept up making the changes to deal with the additional production. And so the sour water stripper was older than heck. They had to put in one new sour water stripper that was unit number two but unit number one had never been replaced so how they were dealing with that was just flaring, just burning it off. So we were really clear that the response had to be that they had to replace this.⁴⁹¹

They were so busy selling us on their preferred solution that it seemed that we were getting really good answers to our questions. And ultimately I think Conoco did a very good job of killing three birds with one stone. And I think we went along with it in part because I recommended that we not continue with strong litigation with the judge that we got and because they did provide us with some things. And we did get a green light from the San Francisco folks that ultimately this is what a refinery ought to do in a situation like this. So, that's when you settle.⁴⁹²

Plaintiffs characterize the mediation as driven by Conoco as well as forces beyond the scope of the mediation. Information flowed primarily in one direction: from Conoco to plaintiffs, who felt as though Conoco was "selling" a preferred option from the outset. Even the first official proposal for a community-driven SEP was made by Conoco. The effect of this arrangement was to give residents a sense that "there wasn't much to discuss," which discouraged attempts to reconfigure the process around their objectives (i.e., monitoring, modeling, community awareness, informed, community-driven process of selecting engineering alternatives):

I think we let them off the hook too easily. And I think the things that they planned on doing were OK, but we really didn't get anything that we were looking for as far as the community goes. We did want some type of air monitoring, we did want some type of notification system in case there was a bad flare-up so that people with allergies could stay in the house or lock themselves off. We wanted some of those kinds of things that we probably could have forced on them. Small things, but things that would really make the community feel a little bit more protective of their health. [We didn't pursue these because] I think that there were so many different people involved in the process, they were so willing to give up what they were giving up, and they were really pushing on a timeline and trying, there was already a suit filed I think and they had so much time to come up with a solution.⁴⁹³

As parties moved toward detailing the final settlement documents, the two most important questions for the residents remained: How did Conoco's sulfur emissions

problems affect the surrounding area and What level of emissions reductions would amount to a noticeable improvement in odor abatement and human health more generally? Residents' notions of how these could be answered were de-linked from Conoco's decision-making processes (both internal and with regard to the RCRA actions), meaning residents had to rely in large part on the expertise and leverage of the environmental agencies to ensure that these were properly addressed.

Agreement is Reached. The final agreement between plaintiffs and Conoco was signed on April 29th, 1999, nearly a year after plaintiffs filed a Notice of Dismissal dismissing the citizen suit without prejudice.⁴⁹⁴ Parties reached an Agreement Regarding Notice of Dismissal on May 4th, 1998, which would guide development of the final Agreement. Table 15 details elements of each document:

Table 15. *COPIRG v. Conoco* Settlement Elements.

Notice of Dismissal Agreement	Settlement Agreement
Plaintiff agrees to file notice of dismissal	Plaintiffs will designate a payee and account to receive funds, to which Conoco will pay a lump sum of \$72,000
Conoco to sign Settlement Agreement, which will become fully effective on or before May 4, 1999	The Community Right-to-Know Project is designed to collect and disseminate information about emissions in the community and to evaluate options to reduce such emissions.
Conoco to use its best efforts to secure participation of a representative of the Globeville, Swansea, or Elyria communities in the Industrial Council (best efforts commitment not subject to breach claim)	Conoco to withdraw its December 30, 1997 request to the state that the state modify Conoco's Permit #91AD180-3 to include turnaround emissions
<p>Conoco and EPA are contemplating entering into an agreement regarding a sulfur dioxide SEP, which will identify several technical options, each of which will result in SO₂ reductions from the refinery. The evaluation process will be completed within three months of the signing of any consent agreement with EPA. Should EPA and Conoco enter into a consent agreement, Conoco will:</p> <ol style="list-style-type: none"> a. Provide plaintiffs with copies of the SEP design and development schedule within two weeks of signing the consent agreement b. For twelve months, beginning on April 27, 1998, Conoco will inform plaintiffs of SEP progress, providing all information regarding the SEP (including all information received from EPA) as soon as practicable c. Conoco is not required to disclose to plaintiffs any information that would be "confidential business information" under state or federal law 	<p>Parties agree and assume the risk that if facts with respect to the matters covered in the Agreement are found hereafter to be other than or different from the facts now believed or assumed to be true by either or all parties, that this Agreement shall nonetheless remain in full force and effect and fully effective</p> <p>Plaintiffs discharge Conoco from all liability, rights, claims, costs, expenses, actions, causes of action, suits of liability and controversies of every kind concerning the claims and incidents which were raised in Civil Action No. 98-N-30</p>
Conoco to pay Plaintiffs their costs, expert witness fees, and attorney's fees associated with this action (\$23,000)	Agreement shall not be construed as an admission by any party
Agreement shall not affect parties' rights if litigation is refiled; if an action reasserting the claims in this case is filed, parties agree that all defenses and arguments will be argued as if this case had been stayed rather than dismissed	All press releases will be jointly issued
Agreement shall be binding upon and inure to the benefit of the parties, their heirs, executors, administrators, successors, and all persons now or hereafter holding or having all or any part of the interest of a party to this agreement	Parties have not assigned or transferred or subrogated any interest in any claims related to the subject matter of the Agreement

Agreement supersedes all prior and contemporaneous negotiations, agreements, representations, and understandings of parties

If any provision is held to be invalid or unenforceable, such holding will render this Agreement invalid unless provisions are severable and if severance is equitable to the parties

Persons represent that they are fully authorized to execute and deliver the agreement on behalf of each party; agreement is binding, constitutes the entire agreement, can not be supplemented unless in writing by each of the parties, shall be governed by the laws of the state, and may be executed in any number of counterpart originals.

Sulfur dioxide emissions had already been addressed through a Consent Agreement approved under EPA Region VIII's RCRA action as well as a Compliance Order issued by the EPA and CDPHE regarding separate RCRA and Colorado Hazardous Waste Act violations.⁴⁹⁵ Terms of settlement for the RCRA actions included a SEP in the amount of \$337,500 plus \$627,500 in addition to mitigated civil penalties.⁴⁹⁶ A SEP, the purpose of which was to reduce sulfur emissions by 200 tons per year, was designed to proceed according to an engineering assessment of three options, detailed by the EPA, for structural changes at the facility to address sour water stripper gas emissions. Plaintiffs in *COPIRG v. Conoco* were kept abreast of developments through periodic reports that included activities accomplished, problems and solutions, any sampling activities, personnel or schedule changes, activities planned, and estimated costs for activities planned. A deadline of October 1, 2000 was set for completion of construction, testing, and implementation of the engineering alternative selected.

A representative of the Cross Community Coalition attended further meetings with refinery staff and three community involvement groups in order to help the residents oversee the implementation of sulfur dioxide emissions reductions while planning an appropriate Community Right-to-Know project. The SEP proceeding on-schedule, leading to improvements to the #1 SRU and its associated tail gas incinerator and allowing sour water stripper overhead gas to be proceeded in the #1 SRU.⁴⁹⁷ Conoco's

completion of the SEP was conditioned in part on its agreement to modify its air emissions permits for its #1 and #2 SRU's to indicate that (a) all sour water stripper overhead gas would be processed in the two units, (b) no sour water stripper gas would be flared unless both SRU's were incapacitated unless there is an emergency situation, and (c) SRU emissions would be monitored and records maintained.⁴⁹⁸ The refinery's startup, shut down, and malfunction emissions fell from an average of 322 tons per year (1994-1998) to 18.4 tons in 2000.⁴⁹⁹ Conoco's overall expenditures for the construction phase of the project totaled over \$2 million.⁵⁰⁰

Implementation. Residents, having achieved their objectives of ensuring substantial reductions in sulfur emissions as well as permit modification that restricted the kind of flaring operations that led to citizen complaints, were left to decide how best to apply their settlement dollars under the Right-to-Know Project.⁵⁰¹ The settlement dollars were spent through the Colorado People's Environmental and Economic Network (COPEEN), an organizing and environmental advocacy group operating under the CCC organization.⁵⁰² A substantial portion of the settlement was used to research the Toxics Release Inventory and Environmental Defense's "Scorecard" website. The goal of this project was to "develop accurate and thorough information around who the major polluters are in the area, what sort of toxics they emit and the possible detrimental health effects of those pollutants."⁵⁰³ COPEEN developed a better understanding of the cumulative impacts of pollution to Northeast Denver, and worked with the 80216 Regional Geographic Initiative (the zip code has the highest emissions levels in the state of Colorado) to disseminate educational materials regarding how to prevent everyday exposures to toxic pollutants.⁵⁰⁴ COPEEN discovered through its research, which was

assisted in part by a public relations representative of Conoco, that much of the emissions in the 80216 zip code did not come from large point sources:

We learned from TRI data that there 2 million pounds a year of legal hazardous emissions into the air, water, and soil. However, we found out that it's really the smaller emitters that emit more than that. Because the three major emitters are classes of businesses. It's autobody paint shops, printers, and wood treatment plants. You know we have so many of those that put together, those plus other small businesses actually emit more than the 2 million pounds but they're not required to report to TRI. So we did that and [the Conoco representative] was very instrumental. In fact, he used our money to have Tetra Tech do some GIS mapping for us.⁵⁰⁵

COPEEN began planning a regional initiative to help small businesses improve their pollution prevention practices in 2000.

The Limits Revisited. The sequencing of events prior to resident involvement in settlement talks strongly influenced their bargaining power. Settlement negotiations had commenced months prior between EPA and Conoco. CDPHA had been involved in detailed discussions over permitting for the #2 SRU with the refinery, encouraging Conoco to modify its permit to include a condition addressing emissions that occurred during planned process unit turnarounds. And since 1990, refinery and environmental managers at Conoco had been working on a series of environmental initiatives including attempts to address sulfur dioxide emissions through trend and incident analysis. These heavily institutionalized efforts created a certain momentum that superceded resident attempts to pursue monitoring technologies for advanced warning and to set precedents for other community-corporate relations. That momentum was strengthened two weeks after plaintiffs filed their notice of intent to sue. Region VIII and Conoco requested a stay of litigation and Conoco began to design a settlement that would satisfy the demands of Region VIII, CDPHE, and COPIRG through a single SEP. While residents had the option to reject the proposed mediator and were given a chance to discuss desired components to an interim agreement, the interim agreement, lodged roughly two months

after a notice of settings was filed for the citizen suit, remained sufficiently ambiguous to permit the conclusion of negotiations between Conoco and Region VIII.

The short timetable, parallel processes, and institutionalized methods for addressing certain elements of underlying problems made it difficult for residents to engage in creative problem-solving, although the refinery manager was amenable to technical discussions and to helping residents understand how production related to sulfur emissions. What limited time that was available for problem-solving during the handful of meetings with the mediator was also limited by the scope of residents' technical assistance, consisting of an engineer who assessed Conoco proposals. Under these circumstances, it is not surprising that residents sensed a company-driven process designed to "sell" a preferred option to a variety of parties. There was little use for residents' comparative advantages in this context. Residents' primary questions of (a) how emissions problems affected the surrounding area and (b) to what extent emissions reductions would amount to a noticeable improvement in odor abatement and human health were relegated to a small "Community Right to Know" project that was not allowed to target the refinery itself.

Discussion. Much of the residents' concerns regarding air emissions were indeed resolved by the convergence of the citizen suit and EPA and CDPHE RCRA actions. Sulfur dioxide emissions originating from malfunctions and maintenance were reduced dramatically, while permit modifications called for an end to the flaring practices that led to citizen complaints. At the same time, the division of labor with regards to generating and exploring options for improving refinery operations and meeting residents' interests *beyond sulfur emissions* left considerable room for improvement. To understand why, we

have to return to the mediation space itself. The meetings between parties to the citizen suit were limited by the agenda to an exploration of solutions to a highly specified and technical problem and bound by time limits imposed by external processes. And while the parties' alternative to negotiated settlement was important, the mediated settlement was shaped to a greater extent by the manner in which the parties' BATNA's *changed*, at times without even their awareness, as Conoco adapted and linked the citizen suit to other actions.

It would be unfair to claim that the residents in the Conoco civil suit lacked a vision for achieving their communities' objectives. To the contrary, the residents' proposals that were communicated to the mediator show a level of subtlety and sophistication that one would expect from a group that had built a community visioning process into an EPCRA settlement months earlier. In the end, residents' desires to involve the community in generating engineering options and encouraging Conoco to carry out modeling and an exploration of fence-line and other monitoring technologies were ignored. Conoco had already determined, through work predominantly with EPA Region VIII, an acceptable range of engineering options to consider through implementation of a SEP. The alignment of two RCRA actions allowed Conoco to suggest that adjudication of *COPIRG v. Conoco* would recommence should plaintiffs in the citizen suit fail to take advantage of a common, environmentally beneficial project. Thus, rather than utilize the resources, attention, and authority of state and federal actors, residents found themselves in a narrow, diminishing window of opportunity, and they acted as one might expect: they settled.

Residents would have had a different bargaining position given (a) the lack of any RCRA action, (b) the initiation of only a CDPHE or EPA action, (c) a reversal in the order in which the actions were filed, or (d) a difference in Conoco's ability to anticipate regulatory change and build it into its goals and staff roles. As the RCRA actions moved toward resolution, residents unwittingly engaged in mediation and considered a zone of agreement that had already been shaped beyond their ability to push back, through the assistance of the mediator, agenda, party representation, or other means. The importance of the mediator's style and approach is clear here: A mediator who operates by modeling the NEPA alternatives analysis approach will encourage biases that are similar to what NEPA engenders: technical and engineering forms of knowledge predominate, and social and experiential knowledge is subsumed. The mediator also failed to assist the parties in building a shared understanding of anticipated regulatory developments. Indeed, the Department of Justice's recent settlement with Conoco greatly overshadows any progress made in sulfur dioxide reductions through the citizen suit. Residents had a chance to achieve meaningful, cheaper, and more cost-effective improvements to monitoring and community relations within the context of larger sulfur emissions reductions encouraged by the federal government. Parallel administrative processes removed that chance.

Appendix A

Table 12. Important Events in Addressing Conoco SO2 Emissions.

Date	EPA	CDPHE	Citizens/COPIRG	Conoco
1980's	Grants final authorization to operate a hazardous waste program in lieu of federal program to CDPHE in 1984; Consent Order issued regarding hazardous waste emissions	Issues Compliance Order in May, 1985 pertaining to recordkeeping, storage of waste in open or poorly maintained containers, inadequate aisle space in hazardous waste areas, and personnel training; Consent Order issued		
1990			COPIRG begins investigation of stationary sources of air emissions in CO as CAA is reauthorized	Stops producing leaded gas at Commerce City refinery; begins to offer low-sulfur diesel fuel at some Denver locations
1991	Notifies Conoco that significant hydrocarbon seepage into Sand Creek has been observed	Permit 10AD998 issued to Conoco for Claus Sulfur Recovery Unit and Tail Gas Incinerator ; Notifies Conoco that significant hydrocarbon seepage observed		Announces joint manufacturing venture with Colorado Refining Co. to share the cost of complying with environmental controls (.05% sulfur diesel fuel required by Pct. 1993)
1992	Inspection of Conoco for RCRA compliance	Inspection of Conoco for RCRA compliance; Issues Compliance Order in November (same issues as above plus container labeling and need to modify inspection program and contingency plans)	COPIRG helps pass the CO CAA; identifies power plants, refineries as major sources of air pollution in state/Denver area	Joint venture concept abandoned after Federal Trade Commission expresses concerns
1993		Asks Conoco for explanation of why No. 2 Claus Sulfur Plant is not subject to monitoring requirements, modification of permit and updated APEN		Requests modification of two air emission permits for sulfur processing facilities; upsets can cause diversion of sulfur to flare; request permit 91AD180-3 be modified to allow diversion of off-gas to #1 SRU; builds #2 SRU

Date	EPA	CDPHE	Citizens/COPIRG	Conoco
1994		Agrees to suspend modifications to 91AD180-3; Issues Inspection Report of Conoco in July		Writes CO attorney general regarding #1 SRU; explains changes made to allow processing of SWS offgas in #2 SRU; press reports toxic emissions increase 12% over 1993 to 143,611 pounds/yr (but has halved emissions since 1988); worker killed while vacuuming spent catalyst waste from reactor that removes sulfur from hydrocarbon streams
1995	Inspection of Conoco for RCRA compliance; violations noted mirror 1985 and 1992 Compliance Orders	Inspection of Conoco for RCRA compliance; grants permit to Conoco for construction of three stage claus sulfur recovery unit to convert sulfur in claus unit tail gas to sodium bisulfite (91AD180-3); emissions not to exceed 171 tons/yr SO2		Modifications to No. 2 Sulfur plant and tail gas unit reported to CDPHE; requests permit modification No. 90AD524 changing fired duty for one heater and updating emissions calculations using current emission factors
1996	Enters into Compliance Order on Consent to resolve Conoco's civil violations of 1989 Consent Order	Discuss odor complaints and upsets at refinery with CDPHE; discuss several areas of possible noncompliance with Conoco; requests data on incidents where acid gas and SWS offgas have been combusted in main plant flare since June 1993	Odor complaints made to CDPHE and other agencies	Discusses odor complaints and upsets with CDPHE; Enters into Compliance Order on Consent to resolve civil violations of 1989 Consent Order (includes SEP to collect household hazardous wastes in Commerce City)
January 1997			Land and Water Fund of the Rockies attorney requests emission inventory retrievals from Air Pollution Control Division	

Date	EPA	CDPHE	Citizens/COPIRG	Conoco
February 1997		Process turnarounds and associated emissions differ from start-ups, shutdowns, and malfunctions; therefore, emissions need to be included in Conoco's construction permit; possibility would be to include process unit turnarounds as alternative operating scenario for #2 SRU		
March 1997	Complaint (78 counts of RCRA violations), proposed civil penalty of \$666,771 according to RCRA civil penalty policy			
April 1997				Motion for extension of time
May 1997				Answer and request for hearing
June 1997	Sends letter to Conoco counsel regarding pilot ADR project; motion for extension to consider pilot project and agency's national position on respondent's legal issues	Requests seven day advanced notice of major planned maintenance activities impacting SO2; planned maintenance for #2 SRU need to be incorporated into construction permit for unit; process turnaround emissions need to be included in permit as alternative operating scenario		Motions for accelerated decision (counts 42-59 and 62-73); claim that failed to conduct certain inspections is unfounded, as Conoco has logs for inspections in question
July-Sept. 1997	Participates in ADR process with administrative law judge – litigation to recommence if settlement not reached; continuation recommended in Sept.			Participates in ADR process with administrative law judge
Oct. 1997	ALJ recommends termination of ADR process; parties remain far from agreement; order scheduling reply brief		Attorney proposes litigation to COPIRG	ALJ recommends termination of ADR process; parties remain far from agreement; order scheduling brief reply

Date	EPA	CDPHE	Citizens/COPIRG	Conoco
Nov. 1997	Requests stay of litigation to pursue settlement negotiations; hearing to proceed Jan 31 if no settlement		Notice of violations and intent to sue	Requests stay of litigation to pursue settlement negotiations with EPA
Dec. 1997		Involved in detailed discussions over permitting #2 SRU with Conoco		Conoco agrees to modify permit to include condition to address emissions which occur during planned process unit turnarounds
Jan. 1998	Reach settlement in principle; settlement to include sum plus SEP that meets SEP guidance; motion for time extension (granted)		Complaint filed under Section 304 of the CAA; proposed penalty of \$27,500 per day	Reach settlement in principle with EPA; motion for time extension (granted)
Feb. 1998			Notice of Settings; order for settlement conference; meet with Mediator on Feb. 17	Notice of Settings; order for settlement conference; meet with Mediator on Feb. 17
March 1998	Motion for extension; proposed SEP is administratively complex and involves CO, EPA, and COPIRG	Evaluates proposed SEP for possible necessary permit modifications; SEP will require administrative permitting review by CO air program, EPA, and COPIRG	Joint motion with Conoco to vacate order; joint motion to vacate scheduling orders (denied); scheduling conference for April 15; meet with Mediator on March 10 and 31	Joint motion with COPIRG to vacate order; joint motion to vacate scheduling orders (denied); scheduling conference for April 15; meet with Mediator on March 10 and 31
April 1998			Scheduling order and rule 26(f) discover plan; meet with mediator on April 20	Scheduling order and rule 26(f) discovery plan; meet with mediator on April 20
May 1998			Agreement regarding notice of dismissal; will sign settlement agreement and release	Agreement regarding notice of dismissal; will sign settlement agreement and release
June 1998	Motion for extension to file Consent Agreement (granted)			
July 1998	Several negotiation sessions since June 1998 with EPA (one remaining for July 21)	State of Colorado Inspection Report for Conoco (July 26)		Several negotiation sessions since June 1998 with EPA (one remaining for July 21)
August 1998	Consent Agreement and Order	Compliance Order on Consent	Order of dismissal (sign agreement with Conoco on April 29, 1999)	Order of dismissal (with COPIRG et al. on April 29, 1999); Consent Agreement and Order with EPA

Chapter 6

Bringing Structure Back In: Lessons from the Cases

Structural Influence over Negotiations: The Narrowing Dynamics Revisited

The cases provide a rich context in which to consider how various factors shape individual perceptions of self-interest and encourage disputants to reach agreements that deviated substantially from the objectives that brought them to the negotiating table at the outset. These same factors displace residents' initial preferences, narrow their interests, and foreclose certain topics from deliberation. These narrowing dynamics are caused by:

1. The manner in which accidents unfolded, were reported, and were responded to prior to negotiation;
2. Efforts, if any, taken by plant-level workers and environmental managers to limit changes to the status quo, including existing role structures, standard operating procedures, production rates, and production processes;
3. The effects of parallel adjudicative or administrative actions (taken on behalf of the affected community) on resident objectives, agenda-setting, data collection, and the timing and scope of available agreements; and
4. Limits imposed by the nature of the facilities involved and the technologies employed (for source reduction, pollution monitoring, and risk regulation, including ways in which these technologies alter resident goals and available paths for meeting them).

I consider each in the following sections.

1. How the Accidents Unfolded

The case studies represent a striking range of contexts from which environmental injustice claims have emerged. From small, isolated neighborhoods faced with encroaching land uses to diverse seaside, unincorporated communities, subsidized housing, wood frame settlements near refinery operations, and a suburban subdivision, the communities appear at first to have little in common. Consider the historical origins

of the environmental burdens involved. Residents of Swansea described how industry was concentrated in North Denver as a result of the construction of I-70 and the placement of railroad switching and holding stations further from downtown. Manchester residents recalled how refinery and ship workers built homes on small lots near their places of employment. Richmond's diverse population was attracted by the acceleration of shipbuilding and other opportunities that emerged during the Second World War. Bayo Vista residents speculated that their housing units were made available after military housing was abandoned and signs of soil contamination were discovered. Those in Kennedy Heights considered attempts to secure government assistance for a land exchange, shoddy construction, and city neglect for repair of waterlines as contributing to their exposure to hydrocarbons. The diversity of accounts, ranging from the isolation and targeting of certain neighborhoods by the forces of industrial location to efforts to live in close proximity to jobs offered by petrochemical plants, is evident in these narratives.

Regardless of the specifics of a community's narrative, they share a sense of ongoing exposure to multiple, severe environmental burdens that are both unpredictable and constantly changing. Rather than a sense that the exposure itself is disproportionate or inherently unfair, it is this complexity, brought about by the clustering of industry near low-income minority residents (or vice versa), that shapes how residents characterize and approach environmental negotiations. Of particular importance is how members of these communities make sense of the uncertainty caused by pollution, nuisances, and multiple sources of stress. Residents, unable to capture the true extent of risks borne as a result of where they live, nevertheless work to generate a general baseline of environmental

quality, against which they can assess any gains or setbacks caused by facility changes or land use decisions. Those living in Smith Addition, a neighborhood near Manchester in Texas, considered Rhone Poulenc a relatively stable facility – hardly a pressing concern when contrasted with the former Hill Chemical Company site or even the practice of illegal dumping on vacant lots. Residents of communities in North Richmond, faced with a diversity of point sources, sought to establish greater predictability of anticipated accidental emissions, through efforts to achieve “no net emissions increases” and real-time fenceline monitoring and notification. Accidents, flaring, shut-downs, shipping patterns, production cycles, disease clusters, and public nuisances caused by various land uses rarely generated patterns that were clear, even to the most observant members of the community.

As a result, resident evaluations of a given facility, accident, or proposed mitigation were prone to bias in that the amount of weight residents gave to specific proposals did not reflect their true impact on the environmental quality of a neighborhood. For example, an accidental release and minor permit modification at Rhone Poulenc heightened attention given by Manchester residents to a facility that represented less than 1% of the toxic emissions from all area facilities (see Table 16). A variety of approaches to emission reduction were considered and rejected by plant management. Then, residents of two neighboring communities, Harrisburg and Smith Addition, were included on the post-settlement Community Advisory Committee (CAC). Harrison and Smith Addition residents evaluated the agreement in the context of generally *decreasing* accidental releases, fires, and explosions in their areas. Even though the agreement reached by the CAC focused on facility changes already mandated by state-issued

permits and regulations, the new CAC members reacted positively to it, because it gave them access to information and lessened their sense of uncertainty regarding facility accidents. Residents involved in the mediated settlement, however, assigned far greater weight to proposals to deal with sulfur emissions, even though such proposals simply reflected what the Department of Justice would require of the refinery shortly after agreement was reached. Residents' positive evaluation of the sulfur reduction proposals made by several agencies reflects the desire to reduce uncertainty, which led residents to assign too much weight to proposals that were less effective in addressing broader neighborhood concerns.

In Richmond, a trend of rapidly increasing toxic releases to waterways swamped small gains in air emission reductions. But residents concerned with the health of those who relied on the Richmond Marina (a Superfund site) for food and other constituencies received little attention during negotiations with Chevron, who was responsible for roughly 99% of the toxic water emissions in the area. A construction permit representing potential increases in toxic emissions and a recent accident at General Chemical led to proposals for low-emission valves and fence-line monitoring, but there was scant consideration given to criteria air pollutants and particulate matter releases that were more reasonably associated with high asthma rates (up to 90%) and absenteeism in nearby schools.

A second commonality across the case study communities concerned the uneven nature of contamination. Whether the community included many point sources of air and water pollution or residual soil and groundwater contamination, the experience of contamination and associated health concerns and diseases varied throughout *each*

community. While certain diseases in Kennedy Heights occurred with prevalence rates that were well above state or national averages, the majority of the subdivision's residents did not suffer from lupus or certain forms of cancer. Chronic contamination, no matter how widespread, will invariably affect a community in discontinuous, unpredictable ways. So while some residents of Murr Way, living near a lupus cluster and above a crude oil storage pit, were reluctant to accept anything short of relocation, many in Kennedy Heights evaluated the results of soil sampling from the standpoint of healthy individuals. In unincorporated areas of Contra Costa County, Unocal's Catacarb release occurred in Rodeo, at a facility bordering Bayo Vista housing units, with prevailing winds carrying much of the substance to Crockett and Tormey. Each community developed a different interpretation of the significance of the release from the standpoint of their unique community health concerns. The unevenness of contamination served to break environmental justice communities into distinct, but not always identifiable factions. Sometimes, these groups surfaced and influenced the negotiation process as representatives of the broader community. Other times, they remained in the background until final settlement offers were made. Their presence was influential in both instances.

The uncertainty and unevenness of environmental burdens in each community shaped resident interests and objectives as conflict erupted. When residents were given an opportunity to develop a shared narrative and understanding of the environmental burdens they faced, they were more successful in avoiding the two common challenges described above that make it difficult to evaluate settlement proposals and to make informed trades between available options. Yet when resident judgment was not influenced by the uncertainty and unevenness of environmental burdens, an equally

challenging dynamic was evident. Residents, while adept at developing proposals regarding emergency preparedness and response, community involvement in plant inspections, and citizen monitoring, were less able to consider how their initiatives should be weighed against proposals by facility managers that focused on financial contributions to the community or health studies and other information gathering exercises.

Community representatives were rarely given an opportunity to accept or implement proposals leading to real changes in the organizational routines or agency oversight.

Table 16. Characteristics of Case Study Environmental Justice Communities.

	Vulcan Materials Mediation	Conoco Mediation	Rhodia Community Audit Negotiation	Chevron Memorandum of Understanding	Unocal Good Neighbor Agreement	Chevron Mass Tort Settlement with Special Master
Neighborhoods	North Denver, CO Communities (Swansea, Elyria)	North Denver, CO Communities (Swansea, Elyria) and Commerce City	Manchester, Smith Addition, Harrisburg communities in Houston, TX	North Richmond, CA neighborhoods	Unincorporated towns (Crockett and Rodeo) and fenceline communities (Bayo Vista and Torrey) in Contra Costa County, CA	Kennedy Heights subdivision in SE Houston, TX
General Demographics	Within Vasquez Blvd./I-70 Site: 17,500 residents, 90% black/Hispanic	Same, in addition to Commerce City (roughly 16,500 residents, 51% minority)	Harrisburg/Manchester: 3,895 residents, 91% black/Hispanic, 80% homeownership	14 neighborhoods in N. Richmond that are closest to industry are 72-94% black	Rodeo: 8,717 residents, 55% minority (includes Section 8 public housing on fenceline); Crockett: 3,194 residents, 21% minority	325 homes, roughly 100% black
Prominent Industrial Land Uses/ Contaminated sites	150 industrial land uses, 4 NPL sites, 3 lead smelters, numerous hazardous waste sites within 450 acres	Same, in addition to Commerce City (mixture of industrial, commercial, residential and the site of 2 refineries and Denver wastewater)	Petrochemical operations along Houston Ship Channel; major point sources included Rhone Poulenc, Valero, Oxid, Lyondell-citgo, Mobil	350 industrial land uses, including refinery, General Chemical, Witco Chemical, Airco Industrial Gases, IC pesticide plant	Petroleum Refinery, Sugar Refinery	Residual crude oil in two former earthen storage pits located underground, below homes in subdivision
Scope of Recent Accidents	Nitric acid spill from rail tanker, 1983; two previous evacuations due to accidental releases	16 incidents involving SO ₂ releases, 1995-1996 (Conoco refinery)	2 sulfuric acid leaks, 1980 (Stauffer); gasoline tank leak, 1986, fire, 1988, oil tank explosion, 1990 (Hill Chemical), explosions (Eddie Oil)	70 fires, 1985-1990, 45 episodes per year, 1992-1994, several high-profile fires and explosions	2,300 wastewater discharge violations, 1977-1989; approx. 20 episodes per year, 1992-1995	Potential hydrocarbon contamination of drinking water during frequent water main breakages

Trend in Community's Toxic Releases from Point Sources Prior to Dispute*	80216 zip code: increase of 24 tons/yr. (air), 0 tons/yr. (water), 5 yrs. prior	80022 zip code: decrease of 29 tons/yr. (air); increase of .5 tons/yr. (water), 5 yrs. Prior	77012 zip code: decrease of 778 tons/yr. (air); decrease of .8 tons/yr. (water), 5 yrs. Prior	94801 zip code (Richmond): decrease of 1.3 tons/yr. (air); increase of 26 tons/yr. (water), 5 yrs. prior	94572/94525 zip codes (Crockett/Rodeo): Decrease of 7 tons/yr. (air); increase of 10.4 tons/yr. (water), 5 yrs. prior	N/A
Trend in Facility of Interest's Toxic Releases Prior to Dispute*	No releases from Vulcan Chemical site	Decrease of 1 ton/yr. (air); increase of 1.5 tons/yr. (water), 5 yrs. Prior	Decrease of 375 tons/yr. (air), 0 tons/yr. (water), 5 yrs. Prior	Increase of 61 tons/yr. (air); increase of 26 tons/yr. (water), 5 yrs. Prior	Decrease of 7 tons/yr. (air); increase of 11.7 tons/yr. (water), 5 years prior	N/A
Facility's % of Community's Toxic Releases, Prior to Dispute*	0% (air and water)	51% (air); 97% (water)	1% (air); 0% (water)	82% (air); 99% (water)	100% (air); 100% (water)	N/A

* = based on TRI data

In addition to how accidents or contamination unfolded and were reported to or discovered by residents, the nature of the responses to each crisis set the stage for the community-corporate negotiations that followed. The accidents that galvanized residents in the six communities were often made worse by organizational decision-making as opposed to simple human error or chance events. While in some of the cases, this worsening of the accident was encouraged by a breakdown in one or more discrete sets of procedures, other accidents were shaped by more systemic organizational problems. The Vulcan Chemicals release, for example, was exacerbated by a lack of safeguards on-site to prevent and respond to accidental releases and little to no emergency response coordination among city agencies. Similarly, Rhodia (chemical transport and offloading procedures and release containment) and Chevron (lack of accident prevention and disaster plans; inadequate regional early warning systems) were unprepared for accidents.

In contrast, systemic breakdowns in organizational routines worsened already serious conditions in three cases. For instance, the Unocal catacarb release continued for two weeks because of a series of internal dynamics and decision-making errors. Residual contamination in Kennedy Heights was ignored and ultimately left in place because of a

breakdown in agency site characterization and risk assessment approaches, tasks that were shared by Chevron and the Railroad Commission. These precursors to the difficulties faced by organized citizens could not have been discovered through a cursory inspection of public documents – they were only reconstructed through extensive review of thousands of pages of internal correspondence and depositions (in preparation for lawsuits). Yet they had a profound effect on the conditions that set the stage for the negotiations that followed.

2. Plant and Environmental Managers: Challenging Changes to the Status Quo

Environmental regulations, which enable agencies to monitor industry practices and pursue a desired level of public health, place numerous demands on the owners of industrial facilities. Companies such as Conoco and Rhodia are required to comply with rules regarding emissions points, input-output factors, fugitive emissions, storage and shipment of waste products, monitoring, and the analysis and prevention of accidents. These requirements are superimposed on existing efforts to maintain continuity of production and profitability. Similarly, agencies, lacking the ability to continuously monitor or inspect even a small subset of existing point sources or contaminated sites, must make tough decisions regarding how best to enforce the same regulations and ensure compliance. Both sides, faced with pressing demands and limited resources, adopt a series of rule-like means (routines) of upholding the appearance that regulations are producing desired effects (i.e., quality of environment, minimal risks to human health). Such routines include the manner in which regulators rely on industry emissions estimates, scatter a limited number of fixed monitors which track a small number of pollutants across their jurisdictions, and make use of standard protocols for responding to

accidental releases. On the industry side, they include commonly-used, non-threatening interpretations of accidental releases, calls for residents to “shelter-in-place,” internal processes for classifying and assessing accidents, and incentives for avoiding facility shutdowns. Often, these patterns of behavior become “second-nature” to those involved, and are no longer open to reconsideration or criticism. They are upheld in order to save time and energy, minimize disagreement, and provide a shared plan for how workers should proceed under different circumstances. It takes an event that can call attention to the assumptions underlying these routines to reopen them to consideration.

Table 17 includes the routines implicated by recent industrial accidents in each of the cases, such as inadequate monitoring and early warning systems, disaster plans that met EPCRA requirements but could not be adequately implemented, safeguards and shutdown procedures that did not prevent the release of substantial amounts of toxic emissions, state-industry coordination of the interpretation of accidents, and industry incentives. The disputes between residents and facility owners grew out of incidents that could have led to a questioning of industry and agency routines. Yet to varying degrees, the relevant role assignments, standard operating procedures, and production processes and incentives remained hidden from the investigatory efforts of the communities involved.

Again, we can distinguish the Vulcan, Chevron, and Rhodia accidents from the Conoco, Unocal, and Kennedy Heights events. At first, the routines evident in corporate and agency responses appear remarkably similar, particularly the facility owners’ interpretations of accidental releases as non-threatening and agency reliance on industry data for their assessments of risk. But the six cases differ in the degree of resistance of

more systemic organizational routines (particularly standard protocols for responding to accidental releases and internal processes for assessing accidental releases and changes to production cycles) to change. Accidents at the Vulcan, Rhodia, and Chevron facilities concerned routines that were addressed shortly after the events which led to community-corporate negotiations. Government officials drafted an overview of agency duties (Vulcan), issued fines relating to chemical transport and offloading procedures and release containment (Rhodia), and addressed early warning systems and air quality (Chevron). In each of the three cases, industry representatives were amenable to discussions concerning these isolated emergency planning and response routines.

By comparison, dispute resolution in the Conoco, Unocal, and Kennedy Heights cases did not address existing role assignments, standard operating procedures, or production processes at the respective facilities. Adjustments in response to accidental releases at the Conoco refinery involved a two-step process. First, new objectives were agreed upon, and specific roles and personnel from upper management were tasked with meeting those objectives using various incentives. Second, middle management at the refinery tracked emission points and proposed changes within budgetary and plant optimization constraints. Conoco used this system to craft a response to sulfur emissions years before residents called for changes at the refinery. The nine environmental initiatives instituted by upper management, and the means through which each was implemented (through new roles or incentives to engineering groups and operators), remained undisturbed throughout the mediated process, which culminated in an agreement that mirrored the facility's existing response to the problem of sulfur emissions.

At the Unocal facility, only one of seven kinds of organizational routines was considered by refinery managers or regulators in the aftermath of the Catacarb release. Confirmatory decision-making, methods of accident investigation within the refinery, organizational memory transfer problems, reliance on visual monitoring, a focus on discrete changes in operating parameters, and the assignment of emergency response authority within the existing hierarchy were ignored. At the same time, ways of responding to off-site complaints were addressed through technological solutions. Specifically, fence-line monitoring was used to gather continuous data of the release of certain toxic chemicals into neighboring communities. This technological solution accounted for a percentage of the resources expended by the parties that did not reflect the importance of off-site complaint response to accidents like the Catacarb release.

In Kennedy Heights, the Railroad Commission and Chevron followed standard protocols for joint site and risk assessment. The state agency and responsible party ignored more obvious exposure pathways and resident narratives of contamination and left the contamination in place after years of investigatory work and the expenditure of millions of dollars. As the sub-optimal results of five of the six negotiations demonstrate, even addressing some organizational routines prior to negotiation does not guarantee a negotiation that will lead to a mutually beneficial agreement. Other routines that are not accessible for reconsideration during a negotiation, such as those described above, will swamp any integrative potential that exists in the bargaining space after an industrial accident.

3. *Parallel Administrative and Adjudicative Processes*

In an environmental justice community, multiple administrative and adjudicative processes are in progress prior to any one accident. These processes shape the extent to which residents are able to address organizational routines at the heart of accidental releases. First, an accident calls attention to existing legislation and standards. The agencies that monitor and enforce existing standards frame residents' sense of harm. For example, in Swansea, regulatory intervention after an HCL release showed residents that companies such as Vulcan Materials can fail to disclose and communicate risks posed by the hazardous materials that they handle (as required by EPCRA and CERCLA). Sometimes, the search for relevant standards proves less than rewarding, as when residents of Kennedy Heights learned that there were no statewide rules governing the cleanup of petroleum spills in "sensitive areas" or when a paucity of data on Catacarb or acceptable levels of exposure were uncovered after a release at Unocal.

Second, existing administrative processes can result in a *de facto* "division of labor" among government agencies. After Conoco was targeted for SO₂ releases and benzene contamination, the EPA and CDPHE initiated various independent and overlapping efforts. These actions allowed Conoco to fashion a proposed SEP before citizen complaints led a statewide public interest firm to add them as parties to its litigation. In Richmond, residents sought to make sense of a series of accidents as a permitting dispute progressed through planning department, city council, and AQMD hearing processes. Each forum involved different rules for the standing of residents as well as the issues that could be discussed. It can take a good deal of time to identify and maneuver through available administrative forums and remedies, as when residents of Kennedy Heights sought

assistance from the City, TWC, RRC, EPA, and state health officials. Often the ordering and combination of available administrative remedies, decided on an ad hoc basis, can itself limit the extent to which residents' sense of harm and the true complexity of environmental burdens are addressed. For example, Manchester residents, having identified a wide range of concerns stemming from facility operations, were at first only allowed to consider those linked to the TWC's contested hearing process. More importantly, administrative actions and legal remedies can open only narrow windows on the routines identified by residents. For example, oversights leading to and magnifying the effects of Vulcan's HCL release were not relevant to an EPCRA suit (which could only encourage fines and record submittal after the fact), while proposals such as community-led inspections were deemed beyond the scope of Chevron's reformulated fuels project by the city council and AQMD.

The complexity of environmental burdens and administrative actions in environmental justice communities can severely limit the potential joint gains available to all parties, despite their efforts to adhere to the procedural elements stressed in the negotiation literature. Yet the uncertainty of environmental conditions perceived by a community will heighten residents' openness to accept a suboptimal agreement. One possible exception was the Vulcan Materials mediation in North Denver. In this case, questions concerning organizational routines were addressed in part on an *ad hoc* basis by local agencies, an administrative complaint by EPA Region VIII settled matters of Vulcan's responsibility to the government, and a mediation process encouraged consideration of additional routines, relationships, and the neighborhood's experiences with broader environmental burdens. Otherwise, externally imposed (and at times immovable)

deadlines, legally mandated agency actions and responsibilities, and parallel enforcement actions narrowed the integrative potential of the negotiations which followed industrial accidents.

The Facilities and Technologies Involved

Any increase in facility or technological complexity, while theoretically offering additional options for integrative bargaining, simply made it more difficult, if not impossible, for community-based organizations to identify the routines and more systemic organizational concerns that if addressed would lead to an expansion of the initial offer space. The facilities represented in the case studies span a continuum of facility complexity, from simple crude oil storage pits to an area of rail devoted to HCL storage and transport, to individual processing units in the Rhodia and Chevron facilities, to multiple units in the Unocal and Conoco refineries. Technological complexity ranged from discrete to systemic within the case studies. The greater the complexity, the more technology-based routines were increasingly hidden from investigatory efforts. This is because the technologies involved guided and constrained what actions the users of each artifact could carry out and therefore, what could be proposed and agreed to during negotiations.

Technology has an influence over dispute resolution because of the human organizations that it encapsulates and locks into place, that are to varying degrees immune to disruption or change. Organizational theorists have long posited that organizations are related to the technologies that they employ, which affect the tasks, techniques, knowledges, and tools that are set in motion and over time influence the social order in which they are introduced. Structuring influences of a technology include

(a) the practices that it reflects or that are demanded by its use, which stabilize through increased usage, (b) the adaptations made to technical conditions (which can be determined by, for example, comparing organizational charts with the social networks that emerge after a technology's introduction), and (c) the distance between the intentions of a technology's designers and the practices of its users. The latter occurs as social networks that prove incompatible with the new technology are not disestablished by those who introduce the new artifact. Technologies that proved most immune to criticism during negotiations included pollution monitoring, risk regulation, and source reduction methods and devices. Their narrowing influence over a dispute resolution process can occur before an accident, through stabilized practices and adaptations that escape detection. Narrowing can also occur during negotiation or agreement implementation, through new roles and responsibilities necessitated by the technology and the disconnect between the intentions of designers and users of the technology.

For example, the fence-line monitoring system set up near the Unocal refinery did not lead to improved post-incident analysis, emergency notification, source reduction, or even information dissemination. This was due in large part to the failure of negotiating parties to disentangle incompatible social networks (existing monitoring officials at the county and within the refinery) or build new networks of interests that were supposed to be met by the technology (such as sensitive populations that required improved detection time, the monitoring of certain compounds, linkages to the county's emergency notification network, and a means of comparing concentrations to regulatory standards). The technology in practice disempowered intended beneficiaries. Raw spectral data was off limits to residents, converted by a consulting firm once a month using an

impenetrable air dispersion modeling program, and sent to a community representative who could not easily compare concentrations to acceptable levels. Indeed, the technology, unbeknownst to negotiating parties, made it impossible to explore the kinds of new monitoring efforts and relationships necessary to address future incidents similar to the Catacarb spill: “level 2” incidents, where a dangerous substance is released over time without the presence of a major fire or explosion. At the same time, the kind, location, and spacing of monitors, data recording methods, compounds monitored, and other decisions inherent in the technology closed off other emissions monitoring solutions from deliberation.

Similarly, the site and risk assessment methods in place long before crude oil residue was discovered at Kennedy Heights dramatically restricted the kinds of data that could be collected, exposure pathways considered, and unique sets of questions answered about the risks inherent in living in the subdivision. In addition, the procedures implemented by Chevron in cooperation with the Railroad Commission did not allow residents, regulators, and industry to more efficiently test the exposure pathways to hydrocarbons that residents were concerned about.

Source reduction technologies, such as the plant optimization models and new processing units at the Conoco refinery, also construct and set in motion new social networks that have a stake in the actions that they as users of the new technologies can carry out. These structural elements are not immediately identifiable by other stakeholder groups. Yet they resist efforts to forge new approaches and practices that are incompatible with the technology-based routines that are already in place.

In the next section, we consider aspects of the dispute resolution process that were affected by the above “structuring” variables. The following negotiation mechanics further narrowed the range of issues and options addressed in the case studies.

Table 17. Accidents/Contamination at Case Study Sites and Routines Questioned.

	Vulcan Materials Mediation	Conoco Mediation	Rhodia Community Audit Negotiation	Chevron Memorandum of Understanding	Unocal Good Neighbor Agreement	Chevron Mass Tort Settlement with Special Master
Industrial Accident/Contamination	HCL release (air)	SO ₂ releases (air), benzene contamination (groundwater)	SO ₂ release (air)	Several releases at Chevron, 1991-2; sulfuric acid release (air) at co-located General Chemical in 1993	Catacarb release (air)	Potential hydrocarbon contamination (water)
Extent of Accident/Contamination	3,300 gallons; 20-30 blocks evacuated (300 residents)	Between .02 and 113 tons released during 16 incidents	30 plant workers sent to hospital (20 across Channel)	Plume extends 15 miles; 24,000 to hospitals, clinics	16 day, 100 ton release affecting neighboring towns; serious injuries reported	Potential exposure spans 20 years; disease clusters near NE pit; pipes affect entire subdivision
Organizational Routines/Oversights Implicated by Accident or Contamination	Lack of safeguards to prevent, respond to release; failure to disclose, communicate risks; coordination problems among city agencies	SRU shutdown procedures; inspections; record-keeping; notices to State; inadequate monitoring of resident exposures	Chemical transport/offloading procedures and risks; release containment; off-site monitoring needs and information sharing	Adequacy of region's early warning systems; accident prevention and disaster plans; need for intensified monitoring	Industry incentives; internal decision-making errors; emergency response/warning systems; off-site monitoring needs and information sharing	Cleanup of basic sediment and water; responsibility for notification regarding pit bottoms; failure to address rupturing waterlines; no clear protocol for cleanup in sensitive areas
Government Response	Overview of agency duties drafted; multilingual public information officers and cards by FD; communications systems improved	See administrative processes below	Potential occupational health and safety, environmental violations by TWC, OSHA, City of Houston	AQMD fines against Chevron and General Chemical increase	County declares Catacarb only a threat when airborne; issues letter regarding safety of garden vegetables; holds panel discussions; Supervisors call for CAP, GNA talks	City calls for replacement of some waterlines; City tests drinking water; RRC works with Chevron on several rounds of soil, groundwater sampling; EPA conducts expanded site inspection

Industry Response	Denies allegations; assesses cost-effectiveness of facility location	Requests permit modifications; enters Compliance Order with CDPHE; enters ADR process with EPA	Declares no health risk due to release; enters hearing process; offers to meet with residents	Chevron releases DEIR (includes plant modernization component)	Declares solution is harmless; begins effort to clean cars, windows, and properties; continues EIR process	Presents methane, comprehensive work plan proposals to RRC; denies presence of harmful concentrations
Administrative Processes	Administrative complaint under CERCLA (EPA Region VIII)	Region VIII overfiles on previous CDPHE actions; State issues compliance advisories under RCRA (benzene in groundwater)	Permit modification (Texas Water Commission)	Construction (County), air (AQMD) permits	Construction (County), air (AQMD) permits	Hearings conducted by RRC during environmental sampling/testing phase
Legislative Processes	EPCRA enacted in 1986	CO CAA enacted in 1992	State/federal reclassification of certain wastes; TRI begin released starting 1987	Clean Air Act's reformulated fuels requirements, deadlines	Clean Air Act's reformulated fuels requirements, deadlines	Changes in State Legislature to rules governing cleanup of petroleum spills
Adjudicative Processes	Citizen suit (EPCRA § 326)	Citizen suit (CAA § 304)	None	Various claims vs. General Chemical	Toxic tort claims, 1000+ claimants	Toxic tort claims, 3000+ claimants

The Effects of Structuring Elements on Negotiation Mechanics

So far, I have discussed the following challenges that arise when environmental justice community representatives must decide whether or not to enter a negotiation:

1. In order to manage the complexity of environmental burdens that they face, residents develop a baseline against which they can evaluate gains or setbacks caused by facility changes or land use decisions. Events at one or more facilities can call attention to an unrepresentative set of changes to the baseline. The amount of weight residents assigned to specific proposals did not reflect their true impact on the environmental quality of a neighborhood. Therefore, baselines of environmental quality can lead community representatives to interpretations of proposals or the success of agreement implementation that encourage suboptimal negotiated agreements. Environmental burdens are at times worsened by a breakdown in either one or more discrete sets of organizational procedures, or more systemic organizational problems that are difficult to detect, even further restricting integrative potential.
2. The sources of disputes in environmental justice communities often include industrial accidents or new information regarding the extent of contamination. These events raise questions about a variety of organizational routines that allow facility management and environmental regulators to meet environmental standards under conditions of resource constraints. Often, the environmental

standards themselves are counterintuitive, particularly when they apply to single facilities or compounds in landscapes comprised of hundreds of emitting facilities. Much of the initial community organizing that follows an industrial accident involves attempts to learn the scope of human health impacts and raise questions about the practices which exacerbated the intensity of the accident and its effects. The extent to which routines are considered by environmental and plant managers will help to shape the integrative potential of the negotiations that follow. The presence of more resistant and systemic routines can dramatically limit integrative potential.

3. The scope of environmental burdens in an overburdened community means that multiple administrative actions are in progress before or during resident attempts to question industry and agency routines and oversights. Existing processes impose deadlines, legally restricting and narrowing the potential remedies. The integrative potential of negotiations that follow is in turn constrained. Narrowing occurs because of the order and combination of administrative activities and the extent to which they open only a small window on the routines responsible for the accident in question.
4. Routines inherent in a highly regulated industry such as petrochemical production can dominate the practices, such as source reduction, pollution monitoring, and risk regulation, that if addressed would lead to the most substantial expansion of the negotiating space. The structures set in motion by these methods, devices, and practices guide and constrain what users can do to promote change. The more systemic or complex the technologies, the more hidden they may remain from the investigatory efforts of the negotiating parties.

As residents intervened in administrative processes, filed lawsuits, or otherwise sought to influence decision-making, these structuring elements influenced the mechanics of the negotiations that followed.

Framing the dialogue

Two of the three assisted negotiations (Kennedy Heights and Conoco mediation) constrained resident control over agendas to a greater extent than the negotiations with Unocal and Rhone Poulenc. In the latter cases, and during the Vulcan mediation, residents showed significant, though varying, degrees of control over what was discussed, when, and in what order. But influence over agendas (through discussions with

mediators or participation in hearing processes) was not always used to the advantage of community representatives, for the following reasons. Each negotiation occurred in the context of recent events, of which residents tried to make sense for purposes of encouraging change. In order to meet broad resident objectives, dialogue had to shift between retrospective (specifics regarding an accident and its root causes, history of residents' sense of harm, how a given facility contributes to residents' perceived environmental baselines) and prospective (problem-solving and relationship-building) concerns. Community concerns often necessitated numerous shifts between the two forms of dialogue, and means of incorporating new knowledge from one into new considerations of the other. Three important dialogic transitions necessitated by the unique concerns of environmental justice communities are:

- From understanding the root causes of a recent incident and the relatively immediate problems that it raises to understanding community-wide concerns that may or may not be related to the incident (with efforts to demonstrate a nexus between the two);
- From presentations of community narratives regarding environmental burdens and claims of industry responsibility to problem-solving on the two levels described above; and
- From problem-solving informed by sufficient technical assistance, information sharing, and joint specification of research questions and assumptions to relationship-building that anticipates the changing representational needs of the community.

Negotiations that allow for such transitions can protect the comparative advantages of community representatives, including their knowledge of resident needs and the ability to mobilize consent around new ideas and proposals, an understanding of the interconnectedness of environmental hazards and ways in which they can be mitigated or reduced, and an intimate understanding of how common mistakes and accidents that are taken for granted by industry and regulators can affect people's daily lives. The

structuring elements present in the cases, as well as an incomplete use of proper mediation tools, did not facilitate these transitions

Negotiations focused on appropriate mitigations to a project or a small number of agency-proposed projects or remedies. Negotiations were most productive when facility management and residents jointly identified isolated engineering (sour water strippers, fenceline monitor placement) or community-based (buffer zone, resident notification) problems to solve. When such problem-solving proceeding from an understanding of community-wide concerns and served as a means of building relationships, the results were positively evaluated (this only occurred in Swansea-Elyria). When problem-solving ignored broader concerns (Conoco mediation, Chevron MOU) or was not linked to proper oversight or relationship building (Manchester, Unocal GNA), outcomes were not favorably interpreted by some of the factions that emerged prior to negotiations.

Unstable zones of possible agreement

A second powerful negotiation mechanic that shaped outcomes was the “zone of possible agreement” (ZOPA) in each case. As discussed earlier, negotiation theorists identify several elements of a negotiation that influence whether a settlement will be reached. First, each party enters the negotiation with a sense of other situations where alternative negotiated agreements could be pursued in the event of an impasse. To identify their “best alternative to a negotiated agreement” (BATNA), negotiators will ask themselves what is the best outcome that I can hope for if the current negotiation fails to yield an agreement? A second boundary to a negotiation is set by what is called the reservation level, or the minimum acceptable settlement within the *current* negotiation.

Negotiators often know their own reservation price (e.g., a contribution of \$100,000 or assurances that flaring will be cut in half) but have scant information about other parties' reservation values. It is important to recognize that BATNA's and reservation levels are usually not equal: in cases where what is offered does not meet a party's reservation level, that party may still elect to settle, given the uncertainty of alternative situations. The area between parties' reservation levels represents the ZOPA. Agreements that fall within the ZOPA are better than each party's reservation level. The upper bounds of a negotiation are set by parties' "target levels," or the best outcome that they expect from all possible negotiations, discounted back to the present. Of course, there is a wide range of ways in which parties can make use of their subjective knowledge of BATNA's, reservation levels, and targets to guide them through a negotiation.

The structuring elements present in the case study disputes make it difficult for community representatives to identify appropriate ZOPA's for the negotiations in which they are involved. At the same time, they limit the ZOPA by closing off routines and practices that only briefly came to light following an industrial accident. First, representatives set reservation levels for a negotiation, but their perceived environmental baselines make it difficult to set the most appropriate number. Residents who described the environmental quality of their neighborhood as improving were also more willing to accept minimal advances in environmental quality through settlement. When they perceived worsening conditions, regardless of whether they were related to the facility involved in a negotiation, residents were more likely set a reservation level for improvements beyond the scope of what facility management views as acceptable.

Second, procedural and time pressures from external processes and the complexity of environmental burdens can increase the need for closure for residents that are party to a negotiation. Thus, in all but one of the cases, representatives of environmental justice communities settled below their reservation level. Indeed, a surprising result was the fact that settlement was reached in each of the cases, despite the tendency described in the literature about settlements for them to fall through when it is perceived that opponents benefit more than community representatives (as could clearly be argued in each case). One would expect that fairness norms would factor heavily in the results of negotiations with environmental justice communities. The literature on negotiation analysis discussed in Chapter 2 would also predict that environmental justice communities focus more on what they would like to get (targets, such as relocation, major production process changes) than what they would be willing to accept or could expect from alternative venues, as occurs when parties adhere to strong norms of fairness. The cases suggest that fairness norms and high reservation prices in the face of perceived declines in environmental baselines, though important, did not greatly influence negotiation outcomes. These were usually swamped by pressures external to the negotiations, caused by parallel processes or additional threats to environmental quality. Small, certain advances in the face of such pressures were assigned greater value than if they had been subjected to dispassionate analysis and comparison, as has been suggested in the behavioral decision-making literature by Kahneman and Tversky.

The strong focus on reservation prices was due in part to either the uncertainty or undesirability of community representatives' BATNA's. One potential BATNA in the case studies was the penalty a company was expected to pay as a result of a lawsuit.

Even when the likelihood of success on the merits in a lawsuit was high, the proceeds could not be used to improve affected communities. Another potential BATNA was the result of a permitting process. Residents in each of the cases shared the sense that permits were going to be issued eventually, even though residents could encourage delays that posed some risk to the project applicants. Thus, resident negotiators focused on reservation levels, which led to a certain amount of dissatisfaction in the broader community. A reservation level is the minimum level for an issue that a negotiator is willing to accept. It is not the same as a broader community's *resistance point*, which is the least favorable outcome that is needed to encourage all of a party's constituencies to accept an agreement. As could be surmised from the characteristics of an environmental justice community, resistance points are the most difficult of all to estimate and satisfy. Not all constituencies are identified until post-settlement, if ever. Their needs will rarely overlap with the potential changes and solutions offered by the most current negotiation. Thus, it becomes extremely important for community representatives to transition dialogue to these broader concerns and to use them to set appropriate reservation levels. Again, external factors make it nearly impossible to even begin to identify resistance points. The only successful example in the present case studies occurred during the Vulcan mediation, but only as a result of years' worth of interaction and planning with the broader community prior to an HCL release.

Reservation prices, which set bounds on minimal acceptable settlement results, were the focus of environmental justice representatives. BATNA's were less important. However, the *sources* of residents' BATNA's (the parallel processes that were already in progress) did help to shape the negotiators' perceived zone of possible agreement. For

example, the EPA maintains guidelines for the out-of-court settlement of EPCRA and other causes of action. So while potential fines in the Vulcan case totaled \$9.9 million, the guidelines encouraged settlement that represented a small fraction of court-imposed penalties. A different set of expectations governs consideration of the Supplemental Environmental Projects that are often used to resolve administrative complaints. And as the number of regulators acting on a facility increases, the ZOPA for resident-negotiators can be altered in unpredictable or counterintuitive ways, as illustrated by the Conoco mediation. Permitting processes also help to shape what parties will consider to be appropriate ZOPA's, by defining the scope of the "project" under consideration and how its connection to proposed mitigation is determined. Thus, the availability of these alternatives shaped how residents approached settlement, rather than the likelihood that they would reach agreement.

Making and judging proposals, tradeoffs

The broader boundaries of a negotiation's ZOPA are set in large part by representatives' reservation prices, a community's BATNA, and structuring elements that close off essential considerations. The limits on negotiation constrained the framing of proposals. Despite the limits on the technical assistance available, community representatives invariably fashioned inventive proposals for improving emergency preparedness, community-corporate relations, facility operations, pollution monitoring, citizen involvement, and aesthetic improvements. Proposals such as the Swansea Community Park plan and the Community Warning Committee's efforts to improve Unocal's classification and response to certain incidents required substantial amounts of

community resources, particularly time. Residents proved particularly innovative in identifying how accidents would affect a community at-large as well as its most sensitive members, and how they could work with facility management to decrease notification times and increase the speed of information sharing in the event of an emergency. Unfortunately, it was often these comparatively low-cost suggestions (e.g., community odor and spill patrol teams, citizen monitors to participate in activation of public notification systems, and other attempts to fundamentally change community-corporate relationships) that were rejected by industry. Many of these proposals were low-cost solutions to some of the root causes of resident concerns, particularly problematic organizational routines. While it is difficult to know for sure why companies rejected these ideas (while at the same time making substantially more expensive investments in financial contributions and community development projects), their hesitancy can be linked in part to uncertainty. Particularly when one is negotiating with the owners of a complex facility such as a refinery, with an established hierarchy, working groups, and procedures for handling emissions and accidents, costs to the firm have to be measured in ways other than the sheer monetary value of the proposed change. A firm will attach a high value to proposed changes in organizational culture. I also found that regulators were unwilling to encourage fundamental changes in how they interact with industry or the public. For example, the experience of Crockett and Rodeo residents with fenceline monitoring suggests that agencies are hesitant to give up their monopoly over air quality monitoring.

What kinds of proposals *were* appealing to industry representatives? As hinted, promises of financial contributions were made early and continuously. Often, proposals

that involved one-time or predictable financial contributions to put toward landscaping, buffers, or even isolated changes to facility components were readily accepted. More importantly, facility managers were able to anticipate changes in regulations, what other firms in their industry were planning, and what agencies would require them to carry out later in a permitting process. These anticipated changes led to many of the proposals made by industry. In Manchester, facility audits, sulfur dioxide monitoring, emissions summaries, and other elements of the agreement with Rhone Poulenc were already called for by the state. Improvements to the community warning system were not required but were already under development through a region-wide effort. The use of bellows valves by Chevron and Unocal was required to some degree by the Air Quality Management District. Sulfur dioxide emissions reductions made by Conoco were going to be required by the Justice Department, as were improvements to fugitive emissions monitoring at several facilities.

Thus, it was often the case that residents were left in a position to accept tradeoffs between (a) their own proposals for citizen involvement and changes to organizational practices and (b) financial contributions, isolated landscaping and equipment changes, and slight improvements over existing practices based on anticipated regulatory or industry shifts. As noted by residents in each case, it was nearly impossible to place a dollar value on the true worth of their proposals, particularly when their implementation could be accomplished at minimal expense. By the time it became clear that these kinds of trades would have to be made, external time pressures and the actions of regulators encouraged residents to accept concessions that clustered at the lower end of the bargaining spectrum.

Bringing Structure and Process Together: Structuration as the Narrowing of Integrative Potential

The unique structural dynamics that influenced the framing of the dialogue, the shape of zones of possible agreement, and tradeoffs in the negotiations discouraged parties from reaching fully integrative agreements. In theory, the potential for an integrative negotiation increases as the number of parties and issues for discussion increase, and the manner in which aspects of the negotiation are valued becomes more diverse. Under these circumstances, parties can search for ways to set up a deal that will benefit each party more than the simple division of one or more assets. Even if parties all want the same things, it is still possible to reach an integrative solution, as long as each side places different values on different elements. In environmental justice negotiations, parties most certainly have different interests (e.g., security, certainty, recognition, economic gain), as well as interests that they value differently. As an example of the latter, residents want steps taken that will increase their security from accidental releases while facility managers desire security in the form of continuous production. Residents want stability in the form of steadily reduced emissions, fewer episodes, and more predictable facility operations. Managers value stable relations with agency monitors and rule enforcers and a stable internal culture and division of responsibilities across various employee roles. They may place different values on time, influenced by the urgency of needed environmental improvements, deadlines, or levels of risk aversion. Residents may give greater weight to costs imposed on future generations than their private counterparts. Each side may assign different odds to anticipated outcomes. For example, if a facility believes that certain raw material costs will increase while a community group anticipates lower costs, they might both agree to tie financial contributions to the

plant's future profit margins, with each side able to live with the anticipated outcome. In addition, parties may have access to different kinds of information, skills, or capabilities that can be combined to form the basis of an agreement. The possibilities for reaching an integrative settlement among multiple parties are fairly unbounded in theory.

In practice, five of the six negotiated agreements analyzed did not achieve the integrative potential that the range of issues and interests involved suggest. There appeared to be barriers to reaching integrative solutions in this context, represented by external structuring elements that shaped the negotiation space:

1. Dialogue did not transition from a limited range of concerns brought about by an incident to broader interests stemming from the true extent of environmental burdens. *This limit on the negotiation space was the result of the severity and complexity of environmental burdens, the uneven nature of contamination, structuring elements (hidden systemic practices and technological solutions) that closed off essential lessons learned following industrial accidents, and pressures exerted by parallel administrative processes and external norms of settlement.*
2. When problem-solving did occur, it was linked to institutionalized expectations for settlement, such as appropriate SEP's or settlement ranges. When relationship-building was considered, it was linked (with the exception of the Vulcan mediation) to relatively unimaginative advisory committees or means of sharing information gathered by the company. *This limit within the negotiation space differed by case according to the unique ordering and combination of administrative norms and solution mechanisms.*
3. Reservation prices, which have to shift in directions that expand the ZOPA and make reaching agreement more likely, were not properly used by residents who relied on perceived environmental baselines for their delineation. Residents at times both over- and underestimated the minimum level of environmental quality changes expected from a negotiation, and sometimes based these estimates on an environmental medium or proposed mitigation that offered less-than-optimal improvements over the status quo. *This limit within the negotiation space was encouraged by the uncertainty of threats to environmental quality and the uneven nature of contamination across constituencies, parallel processes, and a lack of perfect knowledge regarding more systemic facility- and industry-wide solutions (engineering and managerial) that would address resistance points (least favorable outcomes needed to satisfy one's constituencies) rather than reservation levels.*

4. Proposals that made the most effective use of resident skills and comparative advantages were often the first to be rejected by facility management. The kinds of tradeoffs that followed involved the substitution of financial considerations, uncertain data gathering efforts, or industry-anticipated changes for more cost-effective measures of achieving citizen involvement in monitoring, oversight, and emergency response. Industry-initiated proposals were more prone to distributive bargaining than integration of a diversity of resident and facility interests. Residents accepted proposals toward the lower end of these bargaining continua. *This limit within the negotiation space was due to structuring elements that closed off essential lessons learned following industrial accidents from deliberation (systemic managerial and engineering routines) and internal environmental and facility management's valuation of changes to organizational culture, lack of control over information, and the costs of legitimizing resident's ability to gather such data.*

What do the structuring variables that we have considered, and their influences over negotiation mechanics in community-corporate negotiations, tell us about the limits to integrative bargaining theory in environmentally overburdened communities? More importantly, where can process managers (such as mediators) intervene to more productively encourage an expansion of the solution space given the structural constraints at work? The literature on integrative bargaining remains focused on a series of tactics (such as nonspecific compensation and bridging) that have been popularized and applied to a growing number of real-world contexts, through training courses, negotiation simulations used in university coursework, and the expressed values of professional mediators. Yet as we have seen, structural variables, such as administrative procedures set in motion by an accident and organizational routines at work within petrochemical facilities, can limit or even overwhelm efforts to reach integrative solutions. In part, such narrowing is accomplished through an interaction between structural variables and group biases, such as improperly defined ZOPA's, institutionalized notions of how settlements should be defined, and the rejection of low-cost proposals that speak to relationship- and

trust-building among residents, facility managers, and regulators. The extent to which structural forces can constrain integrative potential, regardless of the presence or absence of what the literature would tout as acceptable procedural tactics, may at first glance suggest a marginal role for the process manager, at least in the context of environmentally overburdened communities. On the contrary, I argue that a clearer understanding of the interaction between structural realities and the reactions of negotiation parties, or structure and agency as they are labeled in social theory, points to even more valuable roles for mediators.

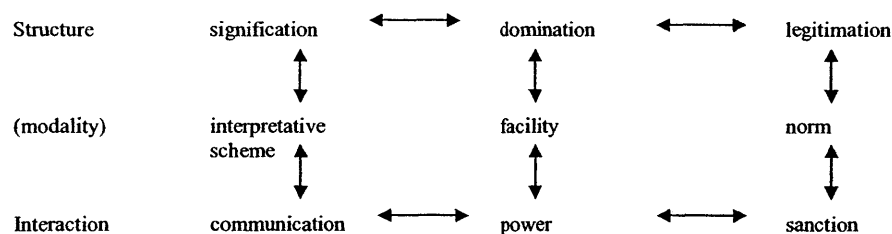
Fortunately, there is a rich literature on how human actors and the structural features of the contexts in which they find themselves interact, beginning with Giddens' notion of structuration.⁵⁰⁶ This seemingly impenetrable literature actually offers some practical lessons for those concerned with meeting integrative potential in a negotiation. The process of structuration occurs through the regular actions of individuals, which leads to the formation of patterns of interaction and standardized practices (e.g., defined roles and responsibilities, modes of decision-making, and approaches to learning).⁵⁰⁷ It is the habitual use of these emergent practices that leads to their institutionalization. The process is reciprocal, because actors then draw upon certain institutional properties in their ongoing interactions, which in turn strengthen and reinforce the structural properties of existing institutions. In this formulation, actors' knowledge and ability to react to various situations is limited by "the situated nature of action, the difficulty of articulating tacit knowledge, unconscious sources of motivation, and unintended consequences of action."⁵⁰⁸ In short, structure, defined as the institutions in which we operate, is "both a product and a constraint on human action."⁵⁰⁹ From this high level of abstraction, we can

quickly return to our practical negotiation setting by describing Giddens' model for how the two domains of individual action and institutional structure interact.

The model begins with what Giddens refers to as “structure” and others have labeled the “institutional realm,”⁵¹⁰ representing a framework of rules that have accumulated through previous actions and interactions. The institutional realm consists of systems of domination, signification, and legitimation. There is also a realm of action,⁵¹¹ defined as the actual arrangements of people, objects, and events that emerge as a social setting unfolds. How do the two realms interact? Giddens argues that institutions are encoded in actors' existing knowledge base as interpretive schemes, resources, or norms.⁵¹² Individuals make use of these scripts, or behavioral regularities, and in so doing the scripts allow for the institutional realm to shape how people communicate, enact power, and sanction certain behaviors while rewarding others.⁵¹³

Figure 8 illustrates this process of structuration.

Figure 8. Structuration Model.



When discussing a day-to-day interaction such as a negotiation process, the notion of scripts is empirically helpful. Defined as “observable, recurrent activities and patterns of interaction characteristic of a particular setting,” scripts are the means through which individual and group practices and understandings accumulate and set conditions for future action.⁵¹⁴ They have been defined elsewhere in the literature as “routines” or “schemata,” but in each case these concepts represent similar phenomena. Schemata

“both constitute and structure knowledge by identifying those elements of a situation that are salient and by describing the causal relations between them,” providing templates for action, goals that direct attention to certain elements of a situation, and identities that link individuals to preestablished roles.⁵¹⁵ Routines are “repetitive, recognizable pattern[s] of interdependent actions,” and tend to refer to behavioral regularities involving multiple actors.⁵¹⁶ A small literature on each has emerged, but in noticing the similarities across them, we can make use of the prescriptive advice each provides for how such regularities can be identified and changed.

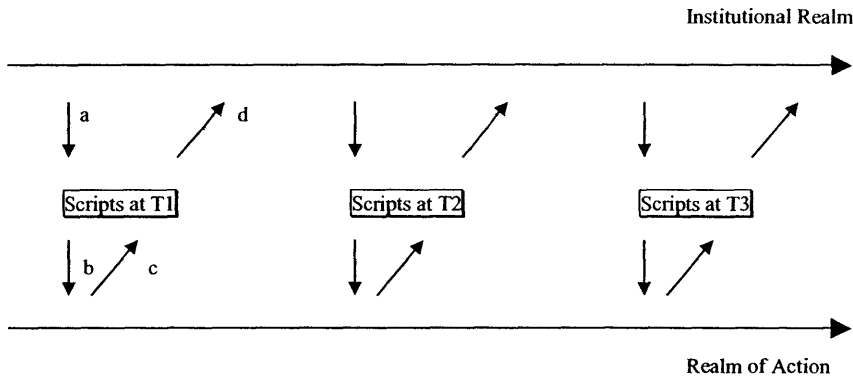
Barley and Tolbert have isolated four means through which Giddens’ two realms of institution and action interact.⁵¹⁷ In this model, vertical motion represents institutional constraints (structure) while diagonal motion represents maintenance or change of an institution through action (agency). The four means of interaction, or “moments,” are as follows:

- a. **Encoding** (a in Figure 9): Institutional principles are encoded in **scripts**, as organizational rules and procedures are internalized, appropriate behaviors are interpreted, and technical designs force actors to engage in certain patterns of activity.
- b. **Enactment** (b in Figure 9): Actors then follow scripts that have been encoded, using standardized rationales when they are aware that they are doing so, but often following them without being aware of their origin.
- c. **Revision or Replication** (c in Figure 9): Events such as technological shifts, market adjustments, and contacts across different organizational cultures can lead to modifications of scripts. However, since each preexisting arrangement of scripts represents the outcome of a previous negotiation, there will inevitably be actors who will resist reopening those deliberations to collective questioning.
- d. **Externalization** (d in Figure 9): Following replication or revision, patterned behaviors or scripts are externalized, or separated from specific actors or circumstances. From this point, scripts become more difficult to identify,

isolate, and criticize, as their relationship to the interests of individual actors becomes less clear.⁵¹⁸

The interactions between each of these moments are illustrated in Figure 9:

Figure 9. Sequential Model of Institutionalization.



The task for negotiation theorists, particularly those who advance integrative bargaining as a superior approach to collective decision-making, is to “identify the forces in the interactional setting *and beyond* that produce the observed outcomes and to link the findings to other indicators of institutional change.”⁵¹⁹ Meaning, if a given setting, such as community-corporate negotiations following an industrial accident, consistently yields suboptimal results despite its integrative potential, the forces both within and without the setting that lead to the results must be identified. This dissertation has set out the key forces, both in terms of negotiation mechanics (in the interactional setting) and structure (beyond), that led to agreements that did not represent a positive shift in the initial offer space, despite the efforts of parties, particularly community-based organizations, to engage in integrative tactics such as cost-cutting, logrolling, and nonspecific compensation.

A theory of narrowing of integrative potential posits that negotiation can be viewed as occurring within a structuration process, where parties try to find common

ground amidst the encoding, enactment, and revision or replication of scripts. It is this cycling of scripts that inevitably will lead to a narrowing of integrative potential. I have identified the scripts and shown how each of them plays a part in restricting what can happen in a community-corporate negotiation. When parties draw upon them in their interactions with other stakeholders, the result is a restraint on human action, or what is possible in this unique context. This theory suggests that some of the recurrent activities and patterns of interaction in the negotiation setting will be practically immune to revision, influencing the structuration process while remaining hidden from the view of negotiating parties. The task of the mediator is to work within such as process, adjusting what elements of the structuration process are accessible to the parties while mitigating the effects of those that will go undetected throughout the negotiation. In practice, this means that in a negotiation setting that includes a collection of rules, norms, and roles that are resilient to the idiosyncratic preferences of individuals, the mediator needs to focus not only on procedural, strategic, and power imbalance concerns, as would be suggested by rational choice and agency perspectives. To assist with integrative bargaining in a highly regulated, institutionalized context, the mediator must recognize that stakeholder preferences are endogenous, and that they are altered and restricted by structural forces, operating through the scripts that they generate, that change how negotiating groups define their self-interest. *In a highly institutionalized context, mediators must therefore play an integral role in helping to shape stakeholder preferences*, or risk ceding much of the integrative potential of dispute resolution processes in highly institutionalized contexts. Traditionally known as a process advocate, a mediator must also consider how to

(a) alter or disrupt what is in practice a narrow range of identifiable scripts that threaten the integrative potential of a negotiation;

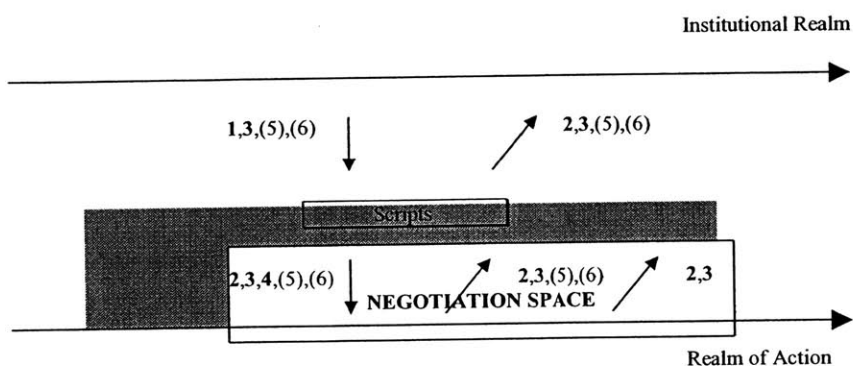
(b) make negotiators aware of how existing preferences are prone to the kinds of biases that scripts encourage; and

(c) help parties, particularly stakeholder groups that are newly or informally organized, formulate new preferences that are less prone to the influence of existing scripts, both identifiable and hidden.

In order to successfully carry out these new roles, mediators need to become adept at recognizing how institutionalized, or structural forces intersect with a negotiation space, which occurs within a small window that is opened on the broader cycling of scripts. Most structural variables that we considered in the case studies operate at each stage of the structuration process. They generate scripts that are followed and, if they avoid scrutiny or detection, become increasingly separated from the actors or specific context of any given negotiation. Some of them are, at least in part, invisible in terms of their influence over the scripts that are then used to identify salient elements of the negotiation process, describe causal relations between them, prescribe templates for action, and influence the goals and identities of the actors. I enclose such variables in parentheses in the figure below. Once these variables appear in the form of scripts followed or standardized rationales expressed, very few of them remain available for use in order to revise the scripts that were followed before, during, and immediately after the industrial accident that led to the negotiation. We have witnessed how difficult it is to essentially disrupt an existing pattern of script replication, and how the predominant structure in which human actors attempt to operate severely narrows any opportunity for expansion of

the zone of possible agreement. How the narrowing of integrative potential occurs has been demonstrated through several major structural conditions, each of which represents recurrent activities, behaviors, or patterns of interaction that were either in place prior to an industrial accident or waiting to be set in motion.

Figure 10. Relative Position of Structuration Process, Structural Variables, and Negotiation Space.



1. Scripts Responsible for Multiple, Severe Environmental Burdens; Uneven Nature of Contamination
2. Agency/Facility Immediate Responses to Crisis (interpretations of accidents, limits to data-gathering, mitigations to projects, fines)
3. Identifiable Environmental and Plant Management Routines and Isolated Engineering Solutions
4. Ordering and Combination of Administrative Remedies for a Unique Industrial Accident
5. Systemic Facility-Wide or Technology-Based Routines Hidden from Investigatory Efforts
6. Firm Internal Decision-Making Structure and Valuation Methods for Proposed Changes to Existing Practices

* the two arrows leading from the realm of action back to scripts represent replication and revision, respectively

The structural variables that played such an important role in shaping the case study outcomes, when mapped within a process of script formation and replication, demonstrate the *essential* role of the mediator in managing a negotiated process. In fact, it is structure in a highly institutionalized context and the limits that it places (narrowing effects) on what is possible in a negotiation that renders the mediator most relevant, as I will demonstrate below.

Some of the structural variables in Figure 10, existing as scripts prior to industrial accidents, do not lend themselves to consideration by the parties within a limited window of opportunity following an industrial accident. I identified systemic, facility-wide as

well as technology-based routines that only a sustained data gathering effort, involving sources of information unavailable in the immediate aftermath of an accident, could unearth (denoted by the number five in Figure 10). Similarly, a facility owner's parent corporation follows an internal decision-making structure and values options within the context of such facility-wide optimization initiatives, which are also difficult to link to an isolated set of problems exposed by an accident (number six, above). These two variables materialize as scripts that cycle through and sometimes even past a negotiation, in the form of recurrent activities and patterns of interaction, rules and the arrangements of people they encourage, and institutional properties that leave their mark on all of the above.

Similarly, an accumulation of rules in the institutional realm produces the unique mix of environmental burdens experienced by a community. This accumulation materializes prior to an accident or negotiation (number 1 in Figure 10). Environmental management procedures are internalized within facilities and regulatory bodies, actors within these organizations engage in certain patterns of interaction, and these groupings of procedures, behaviors viewed as appropriate, and patterns of interaction leave facilities more prone to pollution episodes or make it more difficult to identify and clean up contaminated sites. The severity and uneven nature of the environmental burdens that result are at least in part understood by stakeholders prior to a negotiation. As we have seen, however, it takes a sustained effort months or even years prior to a negotiation to prepare community representatives to appreciate and accurately gauge the environmental burdens that they face. This structural variable can only be detected within a negotiation in the form of the immediate response scripts of agency and facility officials to a crisis

(number 2), and a severely limited set of identifiable routines and engineering solutions that lend themselves to identification and consideration (number 3). The combination of scripts generated by structural variables 2 and 3 constitutes the integrative potential available after the remainder of the structural variables acted upon the negotiation space, in large part because, as shown in Figure 10, they were the only scripts that lent themselves to revision by the negotiating parties (denoted by the arrow on the far right in Figure 10).

A final set of scripts, relating to the ordering of administrative remedies due to the division of labor among regulatory agencies (number 4 in Figure 10), emerged in unique combination after each accident. The sheer clustering of environmental burdens and the fact that each accident occurred at a different point along agencies' regulatory timelines means that the precise set of administrative processes, standards, and other scripts directed at an isolated accident is never replicated. Thus, these scripts influence the structure of a negotiation after an accident occurs, but are not available in the same combination for future accidents. They, too, are replicated and cycle back into the institutional realm following the completion of a negotiated process.

Structure Matters: Negotiation Process Innovations and Inaccessible Scripts

Negotiation theorists may object to a structural account of the limits to integrative bargaining, and argue that it ignores new process techniques in the mediation literature. Innovations such as joint fact-finding or post-settlement adaptations could be used in a highly institutionalized context where existing scripts (patterns of interaction in an organization) need to be broken down over time as parties solve problems or implement

agreements. It could also be argued that failure to reach integrative potential has more to do with a lack of *effective* mediation, both pre- and post-agreement, than structural concerns. True joint fact-finding, for example, was not carried out in the cases.⁵²⁰ Joint fact-finding occurs when stakeholders identify issues that need to be analyzed and related technical information that is unavailable. A mediator then suggests engineers and others with technical expertise who can answer such questions, and guides the parties to an agreement over the choice of experts, assumptions underlying their proposed analyses, and even methods for interpreting findings before they are issued, preferably in a way that non-technical stakeholders can understand. Similarly, a mediator can work with the parties to develop monitoring arrangements to keep track of implementation, administer funds necessary to compensate for unexpected outcomes, and coordinate further data gathering.⁵²¹ An agreement that helps parties adapt to unexpected events increases the integrative potential of a negotiation, because different stakeholder estimates of likely outcomes can be used to make tradeoffs while ensuring that no party is overwhelmed when their estimates prove inaccurate.

To some extent, the call for better use of process innovations for dispute resolution applies to the case studies. Indeed, the only negotiation to reach its integrative potential (following an HCL release in Swansea-Elyria) did so because a mediation team carefully guided the parties through problem-solving and relationship-building (including the use of contingencies) once community-wide concerns were gathered and translated into working proposals. However, the negotiation also took place in the least institutionalized setting of the six that were considered, where hydrochloric acid storage at a railroad transfer station was the most complex task involved. In the other cases,

merely crafting data gathering exercises to proceed from shared assumptions among the parties (or agreements that can be revisited and adjusted at a later date) would not be sufficient to unearth scripts already separated from the actors or the specific context of a conflict, and not discoverable by the mediator. Such “invisible” scripts (numbered 5 and 6 in Figure 10) could not be used to revise organizational routines as part of a negotiation. These particular patterns of interaction within the organizations were not recognizable, if at all, until negotiating parties experimented with new technologies, monitoring approaches, and other environmental management techniques *after* agreements were reached. Invisible scripts can not be fully anticipated through contingencies prior to the start of this experimental, post-agreement phase. Invisible scripts also demand something more than mere adaptation, which effective mediation offers to parties post-settlement. The most embedded scripts can only be disrupted or altered by organizational change, which occurs when people and organizations abandon familiar routines and learn new ways of doing things. By comparison, adaptation, even when more effectively used by mediators to encourage parties to alter scripts that can be identified during a mediation process (categories 1 through 4 in Figure 10), helps to maintain the broader status quo in terms of more hidden organizational practices. Let us consider the three in-depth case studies for evidence of the limited effectiveness of even advanced mediation techniques such as joint fact-finding and adaptation through contingent agreements.

The Kennedy Heights mediation was court-ordered after joint completion of site and risk assessment activities by a state agency (RRC) and regulated entity (Chevron). The mediation context benefited from a lack of ongoing, complex petrochemical operations following contamination of the soil at Kennedy Heights. Because of this,

there were not as many of the more identifiable scripts in play, such as isolated engineering solutions, for use during mediation. Instead, the interaction between Chevron and RRC reflected longstanding internal decision-making, technology-based, and valuation routines within both organizations that I was only partially able to unearth by collecting years' worth of internal correspondence from the organizations. A skilled mediator certainly could use joint fact-finding techniques to avoid the replication of some of the data gathering limits and environmental management routines within the RRC, but the sheer volume of assumptions employed by private contractors hired by Chevron and relied upon by RRC, as well as scripts that governed the close coordination of their operations, could not be addressed during site characterization. These assumptions, which accumulated over several years of data gathering when incentives to reach a negotiated settlement did not exist, severed data gathering from resident narratives of exposure to hydrocarbons before a mediator even theoretically could become involved in the dispute. Efforts to include resident narratives of exposure in any joint fact-finding would lead to additional costs that RRC was in no position to absorb, and would not account for the lack of balance in the RRC/Chevron relationship and the kinds of ad hoc choices that RRC made because of severe resource constraints. In short, the information that primary stakeholders needed to negotiate a joint fact-finding process was locked within private contractors, particularly those employed by Chevron. I was only able to extract this information after-the-fact through extensive document review; the data could not be generated through a standard conflict assessment by a professional mediator. If a joint fact-finding process was in place, it would lead to minor adaptations by the RRC/Chevron but leave their fundamental relationship, the true root cause of continued

resident exposure to toxic chemicals, intact. The limits to integrative bargaining, even with perfect information and use of every process innovation at the mediator's disposal, would persist, as they are linked to organizational change requirements that go beyond any single dispute.

The same inability to discover the true root causes of an industrial accident was found in the negotiations that followed the Unocal Catacarb spill. Effective mediation can address such shortcomings as the anchoring effects of a draft settlement, representational challenges within the several distinct communities, and even perhaps the span of available windows of opportunity for negotiation. A skilled mediator can identify the parties' interests and ensure that some of the more pressing concerns among the parties, such as technological fixes, are implemented through use of contingent agreements. Contingent agreements can anticipate how technologies such as a fence-line monitoring system might introduce their own sets of expected behaviors and limitations of operation. Coping with an endless stream of data, calibration, cross-referencing, and interpretation problems, and links to community notification can be better managed post-settlement. Conflict assessments ensure that proposals such as new roles for residents in plant inspection, pollution patrols and citizen monitoring, and early warning are not so readily removed from the agenda. And residents can be better prepared to insist on more than the mere replication of previously agreed-to permit conditions by the refinery, if the mediation process has access to and considers all publicly-available information at the time of the dispute. Yet conflict assessment, contingencies, and other process innovations would not have unearthed the organizational changes needed to avoid "future catacarbs," the stated goal of all parties. Scripts governing how refinery workers at all

levels of the organization reconcile interpretations of refinery condition changes, bring bits of organizational memory across refinery units at times of crisis, attempt to decouple the effects of unit stabilization efforts from broader input-output trends, ineffectively promote dialogue and interaction across divisions, and discourage workers from taking potential outcomes of their decisions to their logical conclusions before they acted, were entirely “black boxed” before negotiations began. These scripts were not even identified by the parties during extensive interviews regarding the accident and negotiation process, which I conducted when the stakeholders had the benefit of hindsight as they shared with me their interests and bargaining positions. A review of every single proposal and good neighbor agreement element across multiple drafts and working group reports (Chapter 4, Appendix B) reveals that these organizational change variables did not once appear on the proposed agenda of even one stakeholder. Encouraging organizational change in a way that will avoid future escalation of routine accidents can not be implemented by even including a representative sample of top-level and lower-ranking refinery officers in a mediated process, as is noted in the literature⁵²² – the necessary changes in this case were only discovered through review of thousands of pages of interview transcripts with every single employee at the facility across a two-week period. The data gathering and process adaptations available to a mediator would have been linked to script types 1-4, producing real joint gains for the parties but leaving the most important organizational changes on the table.

Effective mediation at first glance holds more promise for a process such as the Conoco negotiation. Settlement talks directed by a professional mediator began months after EPA and Conoco sought resolution of demands made by Region VIII and CDPHE.

In fact, the issue of sulfur dioxide emissions was on refinery management's agenda since 1990 through ongoing efforts such as trend and incident analysis. A mediator could sense the momentum that led the above parties to seek a supplemental environmental project that met their demands while also including residents, represented by COPIRG. The SEP addressed some of the more readily identifiable scripts at work within the refinery, and called for isolated engineering solutions. More effective mediation could also address the ordering and combination of administrative remedies, creating a space for resident demands for continuous monitoring and other improvements to be more carefully considered. But the internal decision-making structure within Conoco for adjusting emissions over time (including nine environmental initiatives and a division of roles and responsibilities designed to stay within permit requirements) and the state agency's relationship with Conoco (which is what led to a lack of enforcement of inspection results, particularly for hazardous waste as opposed to sulfur dioxide) were not addressed by the mediator or the parties. More systemic change within either the Conoco-CDPHE monitoring and enforcement relationship or how refinery workers responded to broader regulatory shifts by assigning new roles and incentives to engineering groups, operators, mechanical personnel, and planners was never requested by the parties. Nor would they have been accessible to the parties within the timeframe offered by the court or Conoco's broader attempts to address sulfur emissions.

Considering the use of advanced mediation techniques reveals the true limits to integrative bargaining in a highly institutionalized setting. Negotiations occur within a structuration process, amidst the encoding, enactment, and replication of scripts. Some scripts avoid detection even when a crisis such as an industrial accident opens a brief

window on how an organization makes decisions and meets its objectives. Facing new scrutiny, a petrochemical operation or regulatory agency will adapt itself to anticipate the changing institutions that regulate its environment, in order to protect its legitimacy.⁵²³

The accidents that I considered cost refinery owners millions of dollars and were easily preventable at a fraction of their ultimate cost. They attest to how inefficient methods of production persist in the petrochemical industry, where organizations incorporate externally legitimated formal structures, despite their inefficiency, to satisfy the need for legitimacy in the eyes of regulators and shareholders alike.⁵²⁴ After an industrial accident, firms adapt so they comply with new expectations, such as the kinds of federal regulations that drove most of the negotiations I considered. But it is the desire for legitimacy that drives those adaptations. True organizational change, leading to real efficiencies of production, monitoring, communications, and organizational learning, is hindered by the efforts of petrochemical facilities to conform to new legitimizing requirements (including those that are the subject of a post-accident negotiation).

Leading organizations away from the goal of legitimacy and closer to real efficiencies will require more than process innovations such as post-settlement adaptations and the joint exploration of interests and data gathering. It will require negotiation theorists, professional mediators, and agencies that promote the use of alternative dispute resolution to suggest new roles for neutral third parties. These roles should be discussed, debated, and adopted while understanding that what mediators can accomplish is limited by the *level* of organizational change (abandoning routines that people at all levels of an organization are familiar with and learning new ways to approach longstanding challenges) that can occur within the *kinds* of organizations they bring to the table.

New Roles for Mediators

How would a mediator, or the parties themselves for that matter, be able to make sense of structural forces, particularly before a negotiation process commences? Giddens' theory, extended by Barley and Tolbert, suggests that structure and agency will interact in the scripts or routines enacted by each of the stakeholders. It would be far too great a task to ask a mediator, or a party to a proposed negotiation, to identify the (even partial) extent to which scripts are replicated or revised before they subsequently become externalized, or removed from specific circumstances. Rather, a mediator can play a role within the identifiable scripts that influence a negotiation and are subject to either replication or revision as the parties reach agreement (numbers 2 and 3 in Figure 10). She can also play a *vital* role in shoring up and even influencing preferences so that they are not altered or restricted by structural forces in ways that reduce the integrative potential of a negotiation space (particularly by the scripts that operate undetected), or the potential for broader organizational change.

Altering or disrupting identifiable scripts that threaten integrative potential. First, the mediator can consider the degree to which identifiable scripts (numbers 2 and 3 in Figure 10) are *embedded*, defined as “the overlap between artifacts and expectations generated from routine performances and those generated from the enactment of other structures.”⁵²⁵ For example, the more existing scripts for settling a particular environmental case, monitoring fugitive releases at an oil refinery, or handling citizen complaints within an agency, among others, are strongly embedded in other structures, such as guidance documents, a hierarchical organizational structure, or standard operating procedures that suggest certain information is useful while other data are not, the more

difficult it will be to open them up for deliberation. Scripts, or routines, may be bound up with one of three kinds of structures: technological, coordination, and cultural.⁵²⁶ The kinds of structures in which scripts are embedded matters a great deal for the integrative potential of a negotiation. Let us consider the above structures in order to provide examples of how a mediator could identify certain scripts and the structures in which they are embedded, determine the kinds of resources needed to open these structures for deliberation, and in so doing expand the initial offer space in a community-corporate negotiation. These structures also can tell us about how a mediator should approach her new role as a crucial actor in how negotiating groups define their self-interest.

A script might be imbedded in a technological structure, that will to some degree guide and constrain what actions a user of the artifact can carry out.⁵²⁷ For instance, a mediator who in a conflict assessment identifies that pollution monitoring is a high priority among one or more stakeholder groups should develop some appreciation for how available approaches to monitoring (continuous, parameter, hand-held) demand widely varying organizational structures, collect different kinds of data that can be used to address unique sets of questions, and allow for or discount a range of interactions between regulators, industry, and residents. Altering existing monitoring scripts, embedded primarily in technological structures, will require actions by those who have control over traditional allocative resources, such as funding, knowledge, and technical expertise.⁵²⁸ Certain relational resources may also be important, as technologies that are already in use would have generated networks of actors that operate through mutual respect for certain kinds of skills or expertise.⁵²⁹ A mediator, in consultation with the parties, would be able to explore whether such resources are available and whether they

could be marshaled in the context of a negotiation. It is true that simply encouraging parties to agree to or ignore a proposed monitoring approach may lead to an agreement, as occurred in a number of the case studies considered here. However, such an approach will leave a far more wide-ranging set of joint gains, which could be created through examining underlying scripts and their embeddedness in technological structures, on the table.

A script could also be embedded in one or more coordination structures. Coordination structures represent the “interdependence of action between multiple actors when accomplishing a complex task.”⁵³⁰ Within environmentally overburdened communities, multiple administrative actions are in progress before and during resident attempts to question industry and agency routines. Each is run according to its own expectations and artifacts, which influence who performs various tasks and how they are carried out. In several of the case studies, coordination structures influenced problem-solving by providing institutionalized expectations for settlement and which issues could be considered by the parties. For example, four parallel processes at work in the Conoco mediation in Commerce City removed resident proposals for joint exploration of odor sources, community technical consultation on equipment upgrades, reduction of benzene emissions to groundwater, and early warning technologies from consideration. In their place was a settlement designed to anticipate future sulfur dioxide emissions reduction requirements and address the concerns of several agencies on the issue. A mediator should be able to identify a range of such coordination structures that exist when her attention is drawn to a particular dispute. Changing scripts embedded in these structures will require the exercise of formal and informal authority to reorganize how multiple

actors interact, as well as relational resources such as trust across actors generating each of the parallel administrative actions.⁵³¹

Of greater complexity for the mediator will be characterizing the cultural structures that interact with the scripts used by parties to environmental justice disputes. Cultural structures include “norms of appropriate behavior that enable and constrain particular types and sequences of actions.”⁵³² In every case considered for this dissertation, an industrial accident or the discovery of new information about contamination exposed the norms at work within petrochemical facilities and agencies that limited how facility upsets and accidental releases, sampling and risk assessment, and emergency response were addressed. For example, a 14-day release of a refinery catalyst by a Unocal facility in northern California revealed eight areas of plant management and operations that contributed to the extended accident. Each was open to brief scrutiny because of the publicity and attention surrounding the accident. They included (a) refinery management’s use of confirmatory decision-making, (b) outmoded methods of accident investigation (Process Hazard Analysis), (c) limited transfers of organizational memory, (d) biased results generated by a reliance on visual monitoring and observation of the stacks, (e) reliance on a limited set of operating parameters to gauge facility performance, (f) an inflexible management hierarchy and use of emergency response authority, (g) a response to off-site complaints that did not ensure that essential information would be gathered, and (h) limits to agency reporting and community warning. These scripts are in part the product of cultural structures, which over time framed and negotiated the shared meanings, norms, and identities (i.e., roles and responsibilities) of refinery management and the operators who had access to ongoing

information regarding the release. Many community-generated proposals for anticipating and reporting accidental releases were rejected in favor of a massive expenditure on a technological fix that has yet to be used to improve emergency response. A mediator could have identified both authoritative and relational resources needed to reopen some of the scripts embedded in these cultural structures, in part through collaboration with regulators familiar with the practices common to facility management in the context of an accidental release. If certain scripts are embedded in overlapping cultural and coordination structures that cannot be addressed within a negotiation window, stakeholders to the dispute should be made aware of these limits to integrative potential as well.

We have learned how a few scripts in a highly institutionalized context, which in the case studies included identifiable environmental and plant management routines, isolated engineering solutions offered in the aftermath of an accident, and immediate responses to crisis such as interpretations of accidents, limits to data-gathering, and mitigations to projects, will inevitably percolate to the surface and present opportunities for integrative bargaining. Traditional process techniques could be used to alter or disrupt this narrow range of identifiable scripts, and mediators should work to investigate their embeddedness in technological, coordination, and cultural structures and marshal the kinds of allocative, relational, and authoritative resources necessary to address them. The case studies suggest that even in the absence of a neutral process advocate, a narrow range of scripts such as those listed above will emerge and prove central to any negotiation and agreement reached. But given the vast range of scripts that are either undetectable within a negotiation space or arise in unique combination within a

negotiation, a more central role for the mediator presents itself. The mediator must work individually with the parties to make existing preferences resilient to the biases that scripts encourage, and help them form new preferences that are less prone to the influence of existing, less identifiable scripts.

Making negotiators aware of how existing preferences are prone to the kinds of biases that scripts encourage. As discussed, the scripts outlined in Figure 10 had noticeable effects on community-corporate negotiations in three ways: they made it difficult to transition from isolated engineering or environmental management problems that needed to be solved to community-wide concerns and relationship-building objectives; encouraged an inappropriate focus on reservation levels as opposed to resistance points, or the least favorable outcomes needed to satisfy a locale's constituencies; and led to the rejection of low-cost solutions to root causes of resident concerns, forcing parties to make tradeoffs between such proposals and more certain but inefficient infusions of resources into a community. These three visible effects of the structural variables within the negotiation space, namely dialogue framing, ZOPA construction, and tradeoff formation, can to some degree be influenced by mediators through the traditional use of integrative bargaining strategies. Three tasks for the mediator present themselves in a highly institutionalized context: (a) redirecting the scope of dialogue from root causes of an incident to problem-solving informed by community-wide concerns and relationship-building that anticipates changing representational needs, (b) reducing the emphasis on reservation levels in the presence of unstable baselines and procedural and time pressures, and (c) working to attach a true value to time-intensive but low-cost proposals that represent solutions to identifiable root

causes of resident concerns. By focusing on these tasks, mediators will help to protect preferences from decision-making biases that would otherwise be created by scripts. Every successful effort in this direction will protect some of the integrative potential of a negotiation from further erosion, by recognizing that stakeholder preferences are in fact subject to manipulation in ways that can threaten integrative potential.

Helping parties formulate new preferences that are less prone to the influence of existing scripts, (particularly those that are not readily identifiable). The first two tasks for mediators begin to sketch the contours of a new kind of process manager in highly institutionalized settings, where scripts cycle through the negotiation spaces that occur for brief moments of time within them. To some degree, a mediator who shapes dialogue beyond the circumstances of a given dispute, moves parties toward a better approximation of their resistance points, prepares stakeholders for unique kinds of tradeoffs, and helps them identify the allocative, authoritative, and relational resources necessary to change the comparably few scripts that emerge following a crisis will succeed in protecting the initial solution space from erosion by structural forces. But the presence of scripts that influence the negotiation space while remaining partially or even completely hidden from scrutiny points to the need for entirely new roles for mediators if an *expansion* of the initial solution space can ever be achieved in institutionalized settings. These scripts, particularly those listed as numbers 5 and 6 in Figure 10, represent preferences that have solidified over many years and are therefore the most difficult to identify by negotiating parties. Such scripts do not just cycle through a negotiation space and change procedural dynamics such as the three discussed above. They remove vast

bits of integrative potential from the negotiation space before it is even opened following a crisis.

The fact that these scripts are so deeply embedded in technological, coordination, and cultural structures that they remain hidden from the discrete scrutiny of mediators during a conflict management process suggests the need to rethink the kind of neutral third party assistance that would be necessary to truly expand the initial zone of possible agreement for negotiations that occur within institutionalized settings. Simply intervening after a crisis, documenting the preferences of relevant stakeholders (and even shoring up existing preferences from the influence of structural forces), and pursuing the procedural elements called for by the integrative bargaining literature will prove insufficient. Mediators must assume new roles and relationships with parties in a highly regulated context that begin months or even years before any given dispute emerges after a crisis. They must understand that most integrative potential in these settings can only be captured when parties are *not* in a state of crisis or its aftermath. Prior to crisis and conflict, mediators, through their involvement with groupings of potential stakeholders, must become familiar with the daily routines of environmental and facility managers, so that they can understand the resources at play within regulatory and regulated entities (allocative, authoritative, and relational) and learn where scripts are most likely to be generated. Ideally, mediators, through their association with coalitions of potential stakeholders, will advocate for the co-production of desired outcomes such as environmental protection, by developing ways to move toward organizational decentralization, better communication, new kinds of information exchange, increased responsiveness to concerns, increased trust and coordinated actions, joint efforts to

understand the causes of problems, means of analyzing patterns of problems, and ways of responding creatively to problems through multiple means and coordination with parties not initially involved. Barriers to co-production among stakeholders should constitute the next frontier in the work of negotiation theorists to achieve better resolutions to conflict in highly regulated settings and limit their narrowing effects on integrative potential.

Mediators, who have always been tasked with encouraging both institutional formation and change through the very groupings of parties that they bring together and facilitate and the arrangements for cooperative problem-solving that negotiated agreements leave behind, should therefore become involved in (a) creating new forms of participation and information gathering for all stakeholders, (b) motivating changes in state and facility actions and responses to crisis, (c) increasing transparency and accountability of state and industrial actors, and (d) contributing to joint initiatives to regulate difficult problems.

Conclusion

Negotiations with environmental justice communities reflect in large part resident concerns with existing institutions and how they should be changed. It should come as no surprise that once organized communities take part in negotiations with industry and agency representatives, they will fall victim to some of the biases while ignoring some of the scripts that allow for complex petrochemical operations and their regulation to proceed under conditions of uncertainty. We've seen evidence of this in the negotiation mechanics that were influenced by dynamic baselines of environmental quality, uneven emissions, organizational routines, the roles embedded within technological fixes, and multiple administrative actions. But institutions are not static entities; rather, they are

“ongoing and historically embedded processes” that both enable and constrain behavior. As such, the scripts that translate individual actions into these embedded processes, which in turn limit what can be accomplished by human actors, are not set in stone. They are to varying degrees embedded within technological, coordination, and cultural structures, some of which will indeed be off-limits to stakeholders and mediators alike. But mediators must become more adept at identifying these structural elements, and positing linkages between them and the kinds of scripts, goals, pre-established roles, and other factors that lie at the intersection of agency and structure, and hold promise for limiting or expanding the initial offer space to a negotiation. The historical accumulations of past practices and understandings that set the conditions for problem-solving and negotiation after a petrochemical accident are arguably far more important than the procedural tactics addressed in the literature on integrative bargaining in framing what can and cannot be accomplished. And we have seen that mediators will often be called upon to assess conflicts at moments where exogenous changes, such as industrial accidents, can increase the odds that scripts will be revised, or at least questioned before they are again subject to replication. If we do not encourage negotiation parties to address the scripts, goals, and identities which under normal conditions are hidden within industrial and regulatory organizations, we will forego much of the integrative potential of a community-corporate negotiation. Mediators can assist by identifying and helping parties to question and change scripts, recognizing “the applicability of previously irrelevant actions,” and suggesting new roles for important actors within relevant organizations. Most of the work that will be needed to free integrative potential that is locked within stakeholder organizations will in the end be the responsibility of the parties.

But through conflict assessment, joint fact-finding, and more careful *preference* analysis, mediators can protect a negotiation's integrative potential by identifying some of the narrowing influences at work behind the scenes, and opening them up to review.

Notes to Chapter 1

¹ United States Environmental Protection Agency (1993). Resource Conservation and Recovery Information System, February, 1993.

² For example, the Clean Air Act, Resource Conservation and Recovery Act, and other statutes included grandfather clauses exempting existing facilities from more stringent environmental standards, making it easier for these facilities, often clustered in low-income communities of color, to expand. H. G. Robertson, If your grandfather could pollute, so can you: Environmental "grandfather clauses" and their role in environmental inequity, *Catholic University Law Review* 45 (1995): 131.

³ D. M. Moore, *Planning Policy in the Lower Mississippi River Corridor* (New Orleans: Louisiana Urban Technical Assistance Center, College of Urban and Public Affairs, University of New Orleans, 1994).

⁴ TEX. REV. CIV. STAT. ANN. Art. 1015-b (repealed 1969).

⁵ *Clinard v. City of Winston-Salem*, 6 S.E.2d 867, 868 (N.C. 1940); *Allen v. Oklahoma City*, 52 P.2d 1054, 1058 (Okla. 1935); *Dowdell v. City of Apopka*, 511 F. Supp. 1375 (M.D. Fla. 1981), *aff'd*, 698 F.2d 1181 (11th Cir. 1983).

⁶ Y. Rabin, Expulsive zoning: The inequitable legacy of Euclid. In C. Haar & J. Kayden (Eds.), *Zoning and the American Dream: Promises Still to Keep* (Chicago: Planners Press, American Planning Association, 1989), 108.

⁷ S. Makielski, Jr., *The Politics of Zoning: The New York Experience* (New York: Columbia University Press, 1966); S. Toll, *Zoned American* (New York: Grossman, 1969); C. Willis, How the 1916 zoning law shaped Manhattan's central business districts, in T. Bressi (Ed.), *Planning and Zoning in New York City* (New Brunswick, NJ: Rutgers University Center for Urban Policy Research, 1993), 3-26.

⁸ *Supra* note 6.

⁹ R. Bullard, Environmental racism and land uses, *Land Use Forum: A Journal of Law, Policy, and Practice* 2 (1993), 6-11. Consider Dallas, Texas: In 1944, the Dallas Master Plan outlined several "Negro districts," including one that would become known as West Dallas. The area was also zoned for industrial land uses, and today, this 11 square-mile community encompasses 93 existing or closed facilities responsible for the release of lead, arsenic, cadmium, and a host of other chemicals into the surrounding environment. In addition, the first site for Dallas Housing Authority (DHA) public housing, or "Negro slum area," was selected by the City Manager across the street from a lead smelter in West Dallas. The purpose of this and subsequent developments, particularly the West Dallas Project (1950-55), was to prevent blacks from moving into white areas of the city. The West Dallas housing project (3500 units), the largest low-rise public housing project in the nation, addressed the "Negro housing problem," defined as a "shortage of housing for Negroes in Dallas" that would result in "overcrowding, dissatisfaction, disease, and tension resulting from Negroes buying into white neighborhoods." The project was completely segregated, including separate parks and commercial areas for black, Hispanic, and white residents. Within two years, however, substantial vacancies were reported in George Loving Place, the section reserved for white residents. The DHA attributed this in part to "environmental disadvantages, such as odors, smoke, and dust from neighboring industrial plants." Due to the lack of housing alternatives for blacks in the greater Dallas area, the concentration of blacks in West Dallas public housing increased. Today, the development is 100% African-American and Hispanic.

¹⁰ C. Perrow, *Normal Accidents: Living with High-Risk Technologies* (Princeton, NJ: Princeton University Press, 1999), 102.

¹¹ Concerned Citizens of Norco, Sierra Club-Delta Chapter, Xavier University Deep South Center for Environmental Justice, and Earthjustice Legal Defense Fund, Shell-Norco, toxic neighbor: The case for

relocation (Norco, LA: Sierra Club, 1999); Louisiana Department of Environmental Quality, personal communication, August 2001.

¹² New Sarpy Concerned Citizens and Louisiana Bucket Brigade, *State of the Art or Falling Apart?* (self-published report, 2000); Louisiana Department of Environmental Quality, personal communication, August 2001.

¹³ For example, fugitive emissions from Shell Chemical and the Motiva Refinery in Norco equaled 1.14 million pounds in 1997, compared with 570,000 pounds from stack emissions. United States Environmental Protection Agency, *Envirofacts Report on Shell Norco Chemical Plant and Motiva Refinery* (2001), <http://oaspub.epa.gov/enviro/multisys2.get_list?facility_uin=LA0001851757> accessed 13 June 2001 and <http://oaspub.epa.gov/enviro/multisys2.get_list?facility_uin=LA0000474775> accessed 13 June 2001.

¹⁴ Louisiana Department of Environmental Quality, Draft Motiva Consent Decree, January 20, 2001.

¹⁵ Earthjustice Legal Defense Fund, *Chemical Accident Prevention Law Fact Sheet* (New Orleans, 1 July 1999); R. Bell, Residents sound off on Shell plant; DEQ, EPA, Greenpeace also attend, *Times Picayune*, January 15, 1999, B2.

¹⁶ Louisiana Department of Environmental Quality, Louisiana 1997 Ambient Air Monitoring Sites, <www.ldeq.org/evaluation/airmon/ambsit95.htm> website accessed September 3, 2001.

¹⁷ Particulate matter.

¹⁸ Total suspended particulates.

¹⁹ Chapter 51 of the Louisiana Administrative Code (LAC:33.III.51) does require major sources of toxic air pollutants to submit annual emissions reports. This practice began in 1991. See Louisiana Department of Environmental Quality, Louisiana Toxic Emissions Data Inventory (2001). <www.ldeq.org/evaluation/airmon/tedi.htm> website accessed September 3, 2001.

²⁰ Interview with parish official, April 15, 2001, in Norco, LA.

²¹ R. A. Thomas, D. Baker, and K. Menard, *Improving Communications Between a Company and its Neighbors: A Logical Process and Model*. Report to the National Petrochemical and Refiners Association, Washington, D.C. (26 September 1999).

²² J. L. Jones, Terror strikes again, *Old Diamond News* 1, no. 2 (1998), 1.

²³ "December the 8th, 1998... I went out my backdoor and in the corner of my backyard, I said, 'Oh, my gosh, what is this black cloud,' I mean the black cloud was walking. From out the corner over there, just walking all the way up here (Interview with Member, Concerned Citizens of Norco, April 13, 2001 in Diamond, LA). A recount of these events also mentions a white, smoke-like cloud that residents claimed "stung their eyes and burned their noses." This resulted from a second event that occurred on the same day. At 12:10 p.m., a railroad tank car was overfilled, causing four hundred pounds of material to spill on the group. A Shell-sponsored report indicated that following the spill, "A visible HCL plume drifted over the maintenance building and into the community then rapidly dispersed...samples in the community were caught within three minutes of the event starting. No HCL was measured in any of the samples...communication with the community on this event was minimal." *Supra* note 21. This event received no press coverage. A similar release earlier that year from Shell Chemical forced evacuation of the nearby baseball field on Washington Street, after a release of tetrachloride formed a cloud of HCL over the plant. Again, Shell workers tested the air with monitors and reported no chemicals off-site. See R. Bell, Toxic release halts games, *Times Picayune*, June 9, 1998, B3.

²⁴ *Supra* note 16.

²⁵ W. Harrington, Enforcement leverage when penalties are restricted, *Journal of Public Economics* 37 (1988): 29-53.

²⁶ The Emergency Planning and Community Right to Know Act (EPCRA) was enacted following two chemical releases involving Union Carbide plants in 1984 (in Bhopal, India and Institute, West Virginia). K. Bumoer, *United Musical Instruments v. Steel Company: The conflict over the safety of our communities and the Emergency Planning and Community Right-to-Know Act*, *Northwestern University Law Review* 91 (1997): 1599-1641. The Bhopal accident, which occurred on December 3, 1984, killed more than 6,000 people and sent over 100,000 to the hospital. K. Green, *An analysis of the Supreme Court's resolution of the Emergency Planning and Community Right-to-Know Act citizen suit debate*, *Boston College Environmental Affairs Law Review* 26 (1999): 387-434. In both cases, government officials discovered that the extent of the disaster was heightened by a lack of adequate emergency planning. Following a study by the EPA commissioned the following year (which identified over 6,900 chemical spill accidents across the country in the previous five years), Congress enacted legislation to

improve the public's knowledge of chemicals located in their communities and to create plans at each level of government to respond to future accidents. H.R. Conf. Rep. No. 99-962 (1986). EPCRA provides two kinds of enforcement mechanisms to encourage implementation of its various planning and notification provisions: administrative proceedings initiated by the EPA, and citizen suits authorized when an owner or operator of a facility fails to complete certain forms or submit data or emergency notices. 42 U.S.C. §§ 11045 and 11046.

²⁷ D. Taylor, The rise of the environmental justice paradigm: Injustice framing and the social construction of environmental discourses, *American Behavioral Scientist*, 43(4) (2000): 508-580.

²⁸ D. O'Rourke and G. P. Macey, Community environmental policing: Assessing new strategies of public participation in environmental regulation, *Journal of Policy Analysis and Management* 22(3) (2003): 383-414.

²⁹ The Good Neighbor Project for Sustainable Industries (2003). <http://gnp.enviroweb.org> (accessed May 10, 2003).

³⁰ Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986, 42 U.S.C. §§ 11001-11050 (1986), mandates that the Environmental Protection Agency provide the public with access to all annual information collected on routine releases of certain chemicals (specifically those which fall within Standard Industrial Classifications 20-39 and are released from facilities that employ ten or more workers and use more than 10,000 pounds of a listed chemical within a calendar year. This information is presented in a searchable index and in map form at <http://www.scorecard.org>.

³¹ A 1981 Parish zoning ordinance in St. Charles prohibits heavy industrial plants from locating within 2000 feet of a residential area. As one local official explained, "Those four streets [next to Shell Chemical] would create a quarter of a mile buffer zone which is not uncommon for industrial facilities...For the grain elevators now in the Parish we've got a one mile buffer zone such that you can't build a grain elevator in the Parish anymore because you can't get a one mile buffer zone anywhere." Residents of these grandfathered zones live as close as twelve feet from the fenceline of such facilities as Shell Chemical (approximate distance determined during a field visit on April 15, 2001).

³² C. A. Pope, M. J. Thun, M. M. Namboodiri, D. W. Dockery, J. S. Evans, F. E. Speizer, and C. W. Heath, Particulate air pollution as a predictor of mortality in a prospective study of U.S. adults, *American Journal of Respiratory and Critical Care Medicine* 151 (1995): 669-674.

³³ R. Hoover and R. Fraumeni, Cancer mortality in U.S. counties with chemical industries, *Environmental Research* 9 (1975): 196-207.

³⁴ R. Bullard, Solid waste and the black Houston community, *Social Inquiry* 53 (1983): 273-283; R. Kuehn, A taxonomy of environmental justice, *Environmental Law Institute* 30 (2000): 34-37.

³⁵ United States General Accounting Office, Siting of hazardous waste landfills and their correlation with racial and economic status of surrounding communities (Washington, D.C.: General Accounting Office, 1983).

³⁶ A. Goldman and L. Fitton, Toxic wastes and race revisited (Washington, D.C.: United Church of Christ Commission for Racial Justice, 1994); United Church of Christ Commission for Racial Justice, Toxic wastes and race in the United States: A national report on the racial and socio-economic characteristics of communities with hazardous waste sites (New York: United Church of Christ Commission for Racial Justice, 1987).

³⁷ R. Field, Siting, justice, and the environmental laws, *Northern Illinois University Law Review* 16 (1996): 639; D. Faber and E. Krieg, *Unequal exposure to ecological hazards: Environmental injustices in the Commonwealth of Massachusetts* (2001). <http://www.nupr.neu.edu/news/0012/environment.pdf> (Jan. 9, 2001).

³⁸ G. Keeler, J. T. Dvonch, F. Y. Yip, E. A. Parker, B. A. Israel, F. J. Marsik, M. Morishita, J. A. Barres, T. G. Robins, W. Brakefield-Caldwell, and M. Sam, Assessment of personal and community-level exposures to particulate matter among children with asthma in Detroit, Michigan, *Environmental Health Perspectives* 110 (2002): 173-181; P. Loh, J. Sugerman-Brozan, S. Wiggins, D. Noiles, and C. Archibald, From asthma to airbeat: Community-driven monitoring of fine particles and black carbon in Roxbury, Massachusetts, *Environmental Health Perspectives* 110 (2002): 297-301; R. Ledogar, A. Penchaszadeh, G. Iglesias, and A. Garden, Asthma and Latino cultures: Different prevalence reported among groups sharing the same environment, *American Journal of Public Health* 90 (2000): 929-935.

- ³⁹ G. P. Macey, X. Her, E. T. Reibling, and J. E. Ericson, An investigation of environmental racism claims: Testing environmental management approaches with a geographic information system, *Environmental Management* 27(6) (2001): 893-907.
- ⁴⁰ S. M. Wilson, F. Howell, S. Wing, and M. Sobsey, Environmental injustice and the Mississippi hog industry, *Environmental Health Perspectives* 110 (2002): 195-201.
- ⁴¹ V. A. Rauh, G. L. Chew, and R. S. Garfinkel, Deteriorated housing contributes to high cockroach allergen levels in inner-city households, *Environmental Health Perspectives* 110 (2002): 323-327.
- ⁴² See N. Krieger, Discrimination and health, in L. F. Berkman and I. Kawachi (Eds.), *Social Epidemiology* (New York: Oxford University Press, 2000); R. G. Wilkinson, Socioeconomic determinants of health: Health inequalities, relative or absolute deprivation, *British Medical Journal* 314 (1997): 591-595.
- ⁴³ Reports such as *Toxic Wastes and Race* are credited for leading to (a) the issuance of Executive Order 12898, which calls for "access to public information on, and an opportunity for public participation in, matters relating to human health or the environment for historically disadvantaged populations" and mandates that all executive branch agencies consider the impact of their policies on minority communities (Executive Order No. 12,898, 59 Fed. Reg 7,629 (1994)), (b) the creation of an Office of Environmental Equity, now the Office of Environmental Justice, to monitor the siting of new hazardous waste facilities to ensure adequate consideration is given to the racial and socioeconomic breakdown of potentially affected communities, (c) the establishment of a National Environmental Justice Advisory Council to encourage the dissemination of information on issues pertaining to siting inequities to communities and agencies, (d) the passage of environmental justice legislation in a number of jurisdictions, See ARIZ. REV. STAT. ANN. sections 26-342 to 26-353 (1991); CAL. HEALTH & SAFETY CODE section 25545 (West 1992); DEL. CODE ANN. tit. 16, sections 6302-6312 (1993); FLA. STAT. ANN. sections 252.81-252.91 (West 1991 & Supp. 1994); HAW. REV. STAT. sections 128D-1 to 3.4-128D-23 (1993); ILL. ANN. STAT. ch. 430, para. 100/1-100/19 (Smith-Hurd 1993 & Supp. 1994); IOWA CODE ANN. sections 89B.12-89B.13 (West 1993 & Supp. 1994); KAN. STAT. ANN. sections 5-5701 to 65-5711 (1993); N.J. STAT. ANN. sections 34:5A-1 to 34:5A-31 (West 1998 & Supp. 1994); N.C. GEN. STAT. sections 95-208 to 95-209 (1993); 35 PA. CONS. STAT. ANN. sections 7301-7320 (1993); R.I. GEN. LAWS sections 23-24.4-1 to 23-24.4-9 (1993); TEX. HEALTH & SAFETY CODE sections 505.001-507.01 (West Supp. 1994); VT. STAT. ANN. tit. 18 sections 1721- 1731 (Supp. 1993); WASH. REV. CODE ANN. Sections 49.70.010-49.70.905 (West 1990); W. VA. CODE sections 15-5A-1 to 15-5A-8 (1991 & Supp. 1994), and (e) a limited number of legal victories and numerous efforts to disrupt facility siting and expansion efforts in minority communities.
- ⁴⁴ L. Pulido, A critical review of the methodology of environmental racism research, *Antipode* 28(2) (1996): 147, 149.
- ⁴⁵ See T. Lambert and C. Boerner, Environmental inequity: Economic causes, economic solutions, *Yale Journal on Regulation* 195 (1997): 203; C. Foreman, *The Promise and Peril of Environmental Justice* (New York: The Brookings Institution, 1998).
- ⁴⁶ United States Public Interest Research Group & National Environmental Law Center, *Accidents Waiting to Happen* (San Francisco: NELC, 2001) found that there are more than 20 serious chemical fires, spills, and explosions reported in the United States each day; United States Public Interest Research Group & National Environmental Law Center, *Close to Home: Chemical Accident Risks in the United States* (Washington, D.C.: US PIRG, 1998) found that more than 41 million Americans live within range of a toxic cloud that could result from a chemical accident at a facility located in their home zip code.
- ⁴⁷ United States Chemical Safety and Hazard Investigation Board, How widespread is the chemical hazard? (2003) http://www.chemsafety.gov/about/why_02.htm (accessed May 7, 2003).
- ⁴⁸ *Ibid.*
- ⁴⁹ National Response Center. Incident type (2003). <http://www.nrc.uscg.mil/incidents91-96> [and 97-02].html (accessed May 7, 2003).
- ⁵⁰ J. March and H. Simon, *Organizations* (New York: Wiley, 1958); C. Barnard, Foreword, in H. Simon, *Administrative Behavior* (New York: Free Press, 1976).
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- ⁵³ R. Zajonc, Social facilitation, *Science* 149 (1965): 269-274.

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⁵⁷ I thank Sheila Jasanoff for this phrase.

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Notes to Chapter 2

⁶⁰ Following the initial development of environmental alternative dispute resolution (ADR) techniques, federal agencies began to encourage their application to environmental justice disputes. Examples of federal support include the US EPA Region 6 Office of Environmental Justice's commitment to "facilitate and coordinate ensuring proper actions are taken through identifying stakeholders, assisting in identifying and prioritizing stakeholder needs, setting up meetings with stakeholders, coordinating contact with state, industry, EPA, and other government agencies...serving as an informal mediator between stakeholders, and identifying mediators when formal mediation is called for." United States Environmental Protection Agency Region Six Office of Environmental Justice (2001). *Region Six Environmental Justice Strategic Plan*. <<http://www.epa.gov/earth1r6/6ra/ej/ejstrategy.htm>> accessed January 4, 2003. The federal EPA Office of Environmental Justice expressed an interest in promoting and monitoring the influence of ADR techniques on dispute outcomes, and has worked with the Consensus Building Institute (an environmental mediation firm based in Cambridge, MA) and Justice and Sustainability Associates (a public policy dialogue and facilitation firm based in Washington, D.C.) to develop trainings in dispute resolution for environmental justice organizations. Various other federal and state agencies have adopted an ADR component to their environmental justice activities, including the Texas Natural Resource Conservation Commission ("environmental equity staff [are charged with] determining what the issues are, establishing communication between the parties, and encouraging the development of mutually acceptable solutions," Texas Natural Resource Conservation Commission, *Environmental Equity Program Overview* (2001) <www.tnrcc.state.tx.us/comm/opa/envequ.html> accessed January 4, 2003); the US EPA's ADR Program (targeting brownfields redevelopment disputes for facilitation and mediation; see United States Environmental Protection Agency Alternative Dispute Resolution Program, *Resource Guide: Resolving Environmental Conflicts in Communities*, May 2000); the US Department of Interior (describing how the Bureau of Reclamation and the National Park Service are prepared to use ADR in response to environmental justice disputes; see United States Department of Interior, *Environmental Justice Strategic Plan*, Washington, D.C., 1995); and the US Department of Transportation (describing training initiatives that address consensus building and conflict resolution for use in public decision-making processes; see United States Department of Transportation, *Environmental Justice Training Courses* (2001) <<http://www.fhwa.dot.gov/environment/ejustice/train/>> accessed January 4, 2003).

⁶¹ The environmental justice movement grew in part out of a variety of developments in the labor movement, including farmworker attempts to gain control over their working conditions and increasing attention given to occupational health by industrial union workers. While a variety of events have been identified as responsible for launching the movement, the most oft-cited event illustrates how changes to environmental laws, media coverage of environmental crises, local decision-making, and coalition politics often converge to shape an environmental justice dispute. The events in Afton, North Carolina unfolded following an attempt to evade recently passed hazardous waste regulations:

In the summer of 1978, Robert Burns and his two sons drove liquid tanker trucks along rural roads in thirteen North Carolina counties and through remote sections of the Fort Bragg Military Reservation. Driving at night to avoid detection, they opened the bottom valve of the tanker and discharged liquid contaminated with polychlorinated biphenyls (PCBs) removed from the Ward Transformer Company in Raleigh onto the soil along the road shoulders. This...continued for

nearly two weeks until 240 miles of road shoulders were contaminated. (E. M. McGurty, From NIMBY to civil rights: The origins of the environmental justice movement, *Environmental History* 2 (1997): 301.)

Because the road shoulders were state-owned, the state had to determine a proper remediation plan following its detection of the contaminated soil. It settled on a proposed landfill site in Afton, a predominantly African-American community in Warren County, North Carolina. Initially, the oppositional strategy of county residents was focused on threats to groundwater and the local economy. Litigation on behalf of a white organization, Warren County Citizens Concerned about PCBs, focused on technical flaws in the landfill's design as well as areas better suited for disposal (Warren County v. State of North Carolina, Civil Action No. 79-560-CIV-5, U.S. District Court, Eastern District of North Carolina, Raleigh Division, 1979). It was only after the court ruled that design improvements could transform the proposed site into an acceptable landfill and the county withdrew its challenge that the Concerned Citizens altered their collective action frame to include race. The nature of toxic contamination, which had in 1978 been thrust into the national spotlight through events at Love Canal, facilitated the formation of a coalition between residents and local civil rights activists. At the same time, the NAACP filed suit against the state, claiming that issues other than technical considerations had precipitated the siting decision (NAACP, et al. v. Anne Gorsuch, et al., Civil Action No. 82-768-CIV-5, U.S. District Court, Eastern District of North Carolina, Raleigh Division, 1982). The civil disobedience that followed, supported by regional and national civil rights activists, included six weeks of daily protests that resulted in hundreds of arrests but failed to block the transport of soils to the site. However, the events in Warren County encouraged civil rights leaders to commission the first of hundreds of empirical studies to examine the interactions between race, class, and facility siting, administered first by the General Accounting Office, the National Law Journal, and the United Church of Christ Commission for Racial Justice. The use of alternative dispute resolution (ADR) techniques to resolve environmental conflicts similarly evolved out of the field of labor relations in the early 1970's, through the support of a small number of practitioners and several private foundations. See M. Ryan, Alternative dispute resolution in environmental cases: Friend or foe? *Tulane Environmental Law Journal* 10 (1997): 397-414; W. Blackburn and W. M. Bruce, *Mediating Environmental Conflicts: Theory and Practice* (Westport, CT: Quorum Books, 1995). In the mid-1970's, the Ford Foundation, with the foresight to understand the growing complexity of environmental disputes, offered financial support for an experimental environmental ADR program. (See G. Bingham and L. V. Haygood, Environmental dispute resolution: The first ten years, *Arbitration Journal* 41 (1986): 3-11.) The first case to fall under the purview of the program concerned the construction of a flood-control dam across a section of the Snoqualmie River in the state of Washington. (See C. Stukenborg, The proper role of alternative dispute resolution in environmental conflicts, *Dayton Law Review* 19 (1994): 1305-1339.) The Army Corps of Engineers faced strong opposition from environmental groups, while neighboring residents, who had endured serious flooding in 1959, favored the project. Mediators appointed by the state developed the first advisory committee for the purpose of resolving an environmental dispute. Composed of ten representatives of relevant stakeholder groups, the committee began to negotiate ways of protecting the region from excessive urban development while ensuring coastal safety. A tentative agreement was struck and subsequently endorsed by the Governor. The Snoqualmie River case triggered several steps toward the institutionalization of environmental dispute resolution techniques and federal support for their usage. By the mid-1980's, mediators and facilitators were employed to manage over 160 environmental disputes in the United States, often centered around the burgeoning statutory framework for environmental protection enacted in the early 1970's. (See D. Elliott, B. A. Ackerman, and J. C. Millian, Toward a theory of statutory evolution: The federalization of environmental law, *Journal of Law, Economics, and Organization* 1 (1985): 313-340.)

⁶² Mary Parker Follett, *Dynamic Administration: The Collected Papers of Mary Parker Follett* (New York: Harper & Bros., 1944).

⁶³ J. Von Neumann and O. Morgenstern, *Theory of Games and Economic Behavior* (Princeton: Princeton University Press, 1944).

⁶⁴ Game theory seeks to abstract from situations of interdependence the parties' alternative courses of action, possible outcomes, and parties' preferences, and prescribes rational choice behavior.

⁶⁵ A. Dixit and S. Skeath, *Games of Strategy* (New York: W. W. Norton & Co., 1999); P. K. Dutta, *Strategies and Games* (Cambridge, MA: MIT Press, 2000); D. M. Kreps, *Game Theory and Economic Modeling* (Oxford: Oxford University Press, 1990).

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- ⁶⁶ R. D. Luce and H. Raiffa, *Games and Decisions* (New York: Dover, 1957).
- ⁶⁷ Axelrod, whose studies of the norms of cooperation seem furthest from two-person encounters, actually employed a repeated two-party prisoner's dilemma, justifying this simplification by the assumption that as agents discriminate in their choices toward others, they reduce *n*-person settings to a series of two-party interactions. See R. Axelrod, *The Evolution of Cooperation* (New York: Basic Books, 1984).
- ⁶⁸ E. Ostrom, *Governing the Commons* (Cambridge: Cambridge University Press, 1990).
- ⁶⁹ J. Nash, Equilibrium points of *n*-person games, *Proceedings of the National Academy of Sciences* (1950).
- ⁷⁰ R. Fisher and W. Ury, *Getting to Yes: Negotiating Agreements without Giving In* (Boston: Houghton Mifflin, 1981).
- ⁷¹ R. E. Walton and R. B. McKersie, *A Behavioral Theory of Labor Negotiations* (New York: McGraw-Hill, 1965).
- ⁷² A. Rubinstein, On the interpretation of two theoretical models of bargaining, in K. Arrow, R. H. Mnookin, L. Ross, A. Tversky, and R. Wilson (Eds.), *Barriers to Conflict Resolution* (Cambridge, MA: PON Books, 1999).
- ⁷³ H. Raiffa, *Lectures on Negotiation Analysis* (Cambridge, MA: PON Books, 1996).
- ⁷⁴ F. Y. Edgeworth, *Mathematical Psychics* (London: Kegan Paul, 1881).
- ⁷⁵ C. H. Coombs and G. S. Avrunin, *The Structure of Conflict* (Hillsdale, NJ: Hove and London, 1988).
- ⁷⁶ H. Raiffa, *The Art and Science of Negotiation* (Cambridge, MA: Harvard University Press, 1982).
- ⁷⁷ J. Sebenius, Negotiation analysis: Characterization and review, *Management Science* 38 (1992): 18-38.
- ⁷⁸ J. Hicks, The foundations of welfare economics, *Economic Journal* 49 (1939): 696-712; N. Kaldor, Welfare propositions of economics and interpersonal comparisons of utility, *Economic Journal* 49 (1939): 549-552.
- ⁷⁹ J. Baron, Utility maximization as a solution, *American Behavioral Scientist* 42(8) (1999): 1301-1321.
- ⁸⁰ World Bank dumps on Third World again, *Race, Poverty, and Environment* (Fall 1991-Winter 1992), 12.
- ⁸¹ Methods of alternative dispute resolution include:
- (a) arbitration - specification of a settlement among parties to a controversy by a person chosen by the parties or appointed under statutory authority; the settlement is binding on the parties; one increasingly popular version of arbitration is "final offer arbitration" (FOA), where each party to a dispute submits its final offer to an arbitrator, who chooses one as the final offer. Proponents of this approach believe that it encourages parties to converge on a settlement prior to the enactment of FOA;
 - (b) mediation - intervention by a neutral party into a negotiation or dispute, whereby the neutral assists parties in negotiating effectively through a variety of forms of interaction (i.e., caucuses, one-on-one discussions, and plenary sessions);
 - (c) facilitation - the neutral management of conversations and meetings aimed at allowing parties to a dispute to focus on substantive matters;
 - (d) mini-trials - abbreviated, non-binding trials used to provide disputants with additional information about the relative legal merits of each party's case; and
 - (e) shuttle diplomacy - intervention by a neutral who serves as a go-between among disputants who for a variety of reasons prefer to negotiate without meeting face-to-face (may be due to different organizational or individual cultures, the need to save face, or the presence of difficult emotions).
- ⁸² G. Kersten, Modeling distributive and integrative negotiations: Review and revised characterization, *Group Decision and Negotiation* 10 (2001): 493-514.
- ⁸³ *Supra* note 70.
- ⁸⁴ D. G. Pruitt, Achieving integrative agreements, in M. Bazerman & R. Lewicki (Eds.), *Negotiating in Organizations* (London: Sage Publications, 1983).
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- ⁸⁷ M. Tajima and N. Fraser, Logrolling procedure for multi-issue negotiation, *Group Decision and Negotiation* 10 (2001): 217-235.
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- ⁹⁵ R. Lewicki and J. Litterer, *Negotiation* (Homewood, IL: Irwin, 1985).
- ⁹⁶ See J. Cutcher-Gershenfeld, T. Kochan, and J. Wells, In whose interest? A first look at national survey data on interest-based bargaining in labor relations, *Industrial Relations* 40(1) (2001): 1-21; T. Kochan and P. Osterman, *The Mutual Gains Enterprise* (Boston: Harvard Business School Press, 1994); E. Cohen-Rosenthal and C. Burton, *Mutual Gains: A Guide to Union-Management Cooperation* (Ithaca, NY: ILR Press, 1993); L. Susskind and E. Landry, Implementing a mutual gains approach to collective bargaining, *Negotiation Journal* 7(1) (1991): 5-10.
- ⁹⁷ L. E. Susskind, It's time to shift our attention from impact assessment to strategies for resolving environmental disputes, *Environmental Impact Assessment Review* 2 (1978): 4-8; G. Bingham and L. V. Haygood, Environmental dispute resolution: The first ten years, *Arbitration Journal* 41 (1986): 3-11; L. E. Susskind, P. F. Levy, and J. Thomas-Larmer, *Negotiating Environmental Agreements* (Washington, D.C.: Island Press, 1999).
- ⁹⁸ R. E. Walton and R. B. McKersie, *A Behavioral Theory of Labor Negotiations* (New York: McGraw-Hill, 1965).
- ⁹⁹ A. Roth, *Axiomatic Models of Bargaining* (Berlin: Springer-Verlag, 1979).
- ¹⁰⁰ P. Schoemaker, The expected utility model: Its variants, purposes, evidence, and limitations, *Journal of Economic Literature* 20(2) (1982): 529-563.
- ¹⁰¹ See M. Bazerman, Negotiator judgment: A critical look at the rationality assumption, *American Behavioral Scientist* 27 (1983): 618-634; M. Bazerman, D. Moore, and J. Gillespie, The human mind as a barrier to wiser environmental agreements, *American Behavioral Scientist* 42(8) (1999): 1277-1300.
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- ¹⁰⁹ M. Morris and S. Su, Social psychological obstacles in environmental conflict resolution, *American Behavioral Scientist* 42(8) (1999): 1322-1349.
- ¹¹⁰ Group interaction studies began in the 1890s with research into pathological groups such as crowds and mobs, shifting to the family unit and 2-3 person groups in the 1930s. A departure from laboratory methods to real life settings (lynchings, mass movements) was disrupted by war pressures in the 1940s. By the 1970s the rate of scholarship declined in general while studies of groups operating within organizations continued. See J. McGrath, *Groups: Interaction and Performance* (Prentice Hall, 1984).
- ¹¹¹ Groupthink results when a relatively insulated group functions under strong leadership and high stress (deadlines, importance of decisions). The group examines few alternatives, information processing is limited, and the group desires stability ("don't rock the boat") more than a high-quality decision. See P. R. Kleindorfer, H. C. Kunreuther, and P. J. Schoemaker, *Decision Sciences* (New York: Cambridge University Press, 1993). Studies of valence, or the degree of acceptability of a solution for a group, reveal that decision points for a group solution can occur relatively early in a meeting or series of meetings, despite the

fact that alternative possibilities are still discussed after that point. Satisfaction with solutions also appears to reflect the character of the group problem-solving process more than the quality of the solution. L. R. Hoffman and N. R. F. Maier, Valence in the adoption of solutions by problem-solving groups, in L. R. Hoffman (Ed.), *The Group Problem-Solving Process* (New York: Praeger, 1979).

The diffusion of responsibility in groups also leads to risky shifts, where groups are likely to engage in more risky activities than any of the individuals prior to the group would have found acceptable.

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¹¹³ E. A. Parson, and R. J. Zeckhauser, Cooperation in the unbalanced commons, in K. Arrow, R. H. Mnookin, L. Ross, A. Tversky, and R. Wilson (Eds.), *Barriers to Conflict Resolution* (Cambridge, MA: PON Books, 1999).

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¹¹⁵ R. Axelrod, *The Complexity of Cooperation* (Princeton: Princeton University Press, 1997).

¹¹⁶ M. Olson, *The Logic of Collective Action* (Cambridge, MA: Harvard University Press, 1965).

¹¹⁷ J. Cutcher-Gershenfeld and M. Watkins, Toward a theory of representation in negotiation, in R. H. Mnookin and L. E. Susskind (Eds.), *Negotiating on Behalf of Others* (Thousand Oaks, CA: Sage, 1999).

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¹²⁰ R. Friedman, Missing ingredients in mutual gains bargaining theory, *Negotiation Journal* (July 1994): 265-280.

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¹²² Exposure assessment is “the process of measuring or estimating the intensity, frequency, and duration of human exposures to an agent currently present in the environment.” Comm. on the Institutional Means for Assessment of Risks to Public Health, National Academy of Science, *Risk Assessment in the Federal Government: Managing the Process* (1983), 20.

¹²³ Risk characterization “first summarizes findings on hazard, dose response, and exposure characterizations, then develops an integrative analysis of the whole risk case.” *Id.*

¹²⁴ Order Granting Motion to Consolidate Cases, *Adams et al. v. Chevron U.S.A., Inc. et al.*, 96-CV-1462 (S.D. Tex. August 6, 1996).

¹²⁵ K. S. Shrader-Frechette, *Risk and Rationality* (Berkeley: University of California Press, 1991), 53.

¹²⁶ U.S. Environmental Protection Agency, Proposed Guidelines for Carcinogen Risk Assessment, 61 Fed. Reg. 17,960, 17,981 (proposed April 23, 1996).

¹²⁷ D. Goodstein, How Science Works, in Reference Manual on Scientific Evidence 67 (Federal Judicial Ctr. Ed, 2d ed. 2000).

¹²⁸ S. J. Heims, *John Von Neumann and Norbert Wiener: From Mathematics to the Technologies of Life and Death* (Cambridge, MA: MIT Press, 1980), 136.

¹²⁹ 509 U.S. 579 (1993).

¹³⁰ *Ibid.* at 589-93.

¹³¹ *Id.* at 590.

¹³² *Id.* at 593.

¹³³ *Frye v. U.S.*, 293 F. 1013 (D.C. Cir. 1923).

¹³⁴ *Ibid.* at 593-4.

¹³⁵ See *General Electric Co. v. Joiner*, 522 U.S. 136 (1997); *Kumho Tire v. Carmichael*, 526 U.S. 137 (1999).

¹³⁶ T. O. McGarity, On the prospect of “Daubertizing” judicial review of risk assessment, *Law and Contemporary Problems* 66 (2003): 155, 172.

¹³⁷ Fed. R. Evid. 702.

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- ¹³⁸ *Supra* note 135.
- ¹³⁹ *Ibid.*, 145.
- ¹⁴⁰ *Ibid.*, 146.
- ¹⁴¹ Lloyd Dixon and Brian Gill, *Changes in the Standards for Admitting Expert Evidence in Federal Civil Cases Since the Daubert Decision* xvi (2001).
- ¹⁴² Jan Beyea and Daniel Berger, Scientific misconceptions among Daubert gatekeepers: The need for reform of expert review procedures, *Law and Contemporary Problems* 64 (2001): 327, 358-9.
- ¹⁴³ Final Judgment, *Adams et al. v. Chevron U.S.A, Inc.*, H-96-1462 (S.D. Tex. October 1, 2002).
- ¹⁴⁴ Hearing before the Honorable David Hittner, *Adams et al. v. Chevron U.S.A, Inc.*, H-96-1462 (S.D. Tex. September 18, 1997).
- ¹⁴⁵ Robert K. Yin, *Case Study Research: Design and Methods* (1994), 38-41.
- ¹⁴⁶ Graham T. Allison, *Essence of Decision: Explaining the Cuban Missile Crisis* (1971).
- ¹⁴⁷ N. Gross, J. Giacquinta, and M. Bernstein, *Implementing Organizational Innovations* (1971).
- ¹⁴⁸ *Supra* note 145 at 40.
- ¹⁴⁹ Elliot Liebow, *Tally's Corner* (1967).
- ¹⁵⁰ Diane Vaughan, *The Challenger Launch Decision: Risky Technology, Culture, and Deviance at NASA* (1996).
- ¹⁵¹ *Ibid.*, 459-460.
- ¹⁵² *Ibid.*, xiii.
- ¹⁵³ *Ibid.*, xiv.
- ¹⁵⁴ Pierce junction well flows 250,000 barrels in two months period, *The Houston Chronicle*, September 2, 1921.
- ¹⁵⁵ Statement showing amount of tankage capacity location and quantity of crude petroleum owned by the pipe line, also amount held in storage for others and unfilled storage at close of business, November 30, 1924, received December 15, 1924 by the Texas Railroad Commission.
- ¹⁵⁶ Deposition upon written questions of James F. Stephenson, *John R. Simmons et al. vs. Chevron U.S.A., et al.* (C.A. No. 95-14770).
- ¹⁵⁷ For example, some documents suggested that Gulf leased the property to local dairy farmers and cattlemen. A review of aerial photographs from 1930 to the 1960's revealed evidence of cows in a field southeast of the NW pit in 1955.
- ¹⁵⁸ D. Krentz (1991). Interoffice correspondence from to Anthony Crisci, Capital Projects, City of Houston, from David Krentz, Environmental Health and Human Services, October 30, 1991.
- ¹⁵⁹ Plaintiffs' Second Amended Complaint, *Adams et al. v. Chevron U.S.A. et al.* (96-CV-1462) (S.D. Tex, October 1, 1996). In a letter to a city official, the contractor who first encountered signs of crude oil contamination also noticed items that appeared to have been dumped in the area of the former pits ("6/3/91 - Hit Foreign Debris at 5002 Fairgreen"; "8/5/91 - Hit Car Rim 11326 Murr Way, underground"; "12/3/91 - Murr Way Station #32+55 (car door)"; "12/3/91- Murr Way Station #32+55 (tire)"). Paskey, C.W. (1992). Letter to Richard Scott, Deputy Director, Capital Projects Department, City of Houston from C.W. Paskey, Construction Coordinator, Pas-Key Construction Services, Inc., August 27, 1992.
- ¹⁶⁰ Wyatt, E.A. (1966). Letter to M.L. Hanna, Gulf Oil Corporation from Earl A. Wyatt, Earl A. Wyatt and Associates, August 15, 1966.
- ¹⁶¹ *Ibid.*
- ¹⁶² Clemons, R.E. (1961). Letter to J.L. Irvine, Vice President, Gulf Refining Company from R.E. Clemons, The Clemons Company, January 5, 1961.
- ¹⁶³ The contents of crude oil storage tank bottoms include a mixture of crude oil, water, and other substances commonly referred to as basic sediment and water, or BS&W.
- ¹⁶⁴ Wyatt, E.A. (1964). Appraisal of 131.61 acres of land, John White Survey, A. 1001, Harris County, Texas, by Earl A. Wyatt, for M.L. Hanna, Gulf Oil Corporation, February 10, 1964.
- ¹⁶⁵ *Ibid.*
- ¹⁶⁶ Wyatt, E.A. (1964). Letter to M.L. Hanna, Gulf Oil Corporation, February 17, 1964.
- ¹⁶⁷ Memorandum from P.J. Maddison to R.B. Gillies regarding Exchange of Properties, Pierce Junction Earthen Tank Farm, Chocolate Bayou Road, Houston, Texas, November 14, 1967.
- ¹⁶⁸ *Ibid.*
- ¹⁶⁹ State of Texas, County of Harris (1968). Conveyance of property from Gulf Oil Corporation to Log Development Company, Inc., January 29, 1968.

¹⁷⁰ Maddison, P.J. (1967). Letter to R.B. Gillies from P.J. Maddison regarding exchange of properties, Pierce Junction Earthen Tank Farm, Chocolate Bayou Road, Houston, Texas, Richmond and Montrose, Houston, Texas, November 14, 1967.

¹⁷¹ Affidavit of John R. Lester, *Dorothy Adams, et al. vs. Chevron, et al.* (C.A. No. H-96-1462).

¹⁷² Verdicts Forecast (1997). Kennedy Heights case narrative. <http://66.12.145.114/vf/narrative/html>.

¹⁷³ Interview with Kennedy Heights resident, April 20, 2002, in Houston, Texas.

¹⁷⁴ Interview with Kennedy Heights resident, April 20, 2002, in Houston, Texas.

¹⁷⁵ Interview with Kennedy Heights resident, April 15, 2002, in Houston, Texas.

¹⁷⁶ Interview with Kennedy Heights resident, April 20, 2002, in Houston, Texas.

¹⁷⁷ Taken from the inscriptions made on the inside cover of *The Holy Bible*, Michelangelo Edition, owned by a resident of Kennedy Heights.

¹⁷⁸ Even after litigation began, City of Houston Utility Complaint Notices from July 14, 1995 to September 29, 1996 reveal a total of 108 utility complaints made by Kennedy Heights residents. Residents continue to complain of water main breaks.

¹⁷⁹ Pas-Key Construction Service, Inc. (1992). Report on Water Project No. 10086.

¹⁸⁰ Paskey, R.L. (1991). Letter to Howard Nicholas, Director of Capital Projects Department, Department of Public Works from R.L. Paskey, Pas-Key Construction Service, Inc., September 26, 1991. Thereafter, the Director of Health and Human Services for the City of Houston recommended that "excavations in the Kennedy Heights subdivision be temporarily halted." October 15, 1991 doc.

¹⁸¹ A new section of the Kennedy Heights subdivision was developed in 1994 and started accepting residents in July of that year. The developers engaged in one of the first environmental reviews of the area, which included soil and groundwater tests of the vacant property by Law Environmental Inc.

¹⁸² The Agency for Toxic Substances and Disease Registry explains that "The Department of Health and Human Services has determined that some PAHs may reasonably be expected to be carcinogens. Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer)." Agency for Toxic Substances and Disease Registry (1996). ToxFAQs for Polycyclic Aromatic Hydrocarbons, <http://www.atsdr.cdc.gov/tfacts69.htm>.

¹⁸³ The resulting mass torts suit was filed against a series of named defendants, including Chevron and Gulf companies and subsidiaries, developers, construction companies, investors, and investment trusts. Plaintiffs' Summary of the Case, *Adams et al. v. Chevron U.S.A., Inc. et al.*, 96-CV-1462 (S.D. Tex. September 10, 1997).

¹⁸⁴ Consultants for the plaintiffs found that "crude oil constituents from tank bottoms entering the drinking water system are distributed to homes in a short period of time." The primary mechanism for the transport of hydrocarbons was "entry from suspension in water surrounding a main break." Dr. Jack Matson found that methane had evolved from the conversion of tank bottom hydrocarbons and represented "an explosive threat to residents within the Pit Number One area (Northeast Pit)." Matson, J.V. (1996). Expert Report: Environmental Conditions at Kennedy Heights Subdivision, Houston, Texas. Prepared for O'Quinn, Kerensky, MacAninch, and Laminack by Jack V. Matson, Ph.D., P.E., Consulting Environmental Engineer, October 1, 1996.

¹⁸⁵ Richard Clapp, MPH, D.Sc., with Boston University, reviewed a report by Meta Environmental, Inc. and testing done in September, 1996, which found several substances which are animal carcinogens "and therefore may be expected to cause cancer and other toxic effects in exposed humans." He also calculated prevalence rates for systemic lupus erythematosus (SLE), and compared his results with estimates of prevalence in whites and African-Americans in the U.S. National prevalence rates ranged from about 10-50 cases per 100,000. His estimate for the combined (current and former) population of homes in Kennedy Heights to be 2,435, of which 10 cases of SLE were reported. The prevalence of SLE in the combined population was estimated at 411 per 100,000, or between 4.9-8.2 times the upper end of the range of prevalence of SLE in the United States population. Clapp concluded that since the lower end of the confidence interval for his estimate was still more than three times higher than the upper range for the U.S. population, the results were not likely to be due to chance fluctuation. Clapp, R. (1996). Report of Richard W. Clapp. October 1, 1996.

¹⁸⁶ *Ibid.*

¹⁸⁷ Ecology and Environment, Inc. (2001). Expanded Site Inspection, Final Report. Prepared for U.S. Environmental Protection Agency, Region 6, May 2001.

¹⁸⁸ City of Houston (1991). Report of laboratory investigation of samples collected from Murr Way locations, City of Houston Public Utilities Branch, Laboratory Section, September 18, 1991.

¹⁸⁹ Arradondo, J. E. (1991). Letter to Howard N. Nicholas, Director, Capital Projects Department from John E. Arradondo, Director, Health and Human Services, October 15, 1991. City officials did not know “exactly what the man-made pits were used for” at this point, although they had obtained aerial photographs indicating the three large pits, each four acres in size.

¹⁹⁰ Lockwood, Andrews, & Newman, Inc. (1991). Potentially petroleum contaminated materials investigation, Kennedy Heights Subdivision. Prepared for the City of Houston, Project No. 10086, November, 1991. Concentrations of total petroleum hydrocarbons that were above action levels for soil contamination set by the TWC were found in soil samples from five of the 21 soil borings.

¹⁹¹ Des Vignes-Kendrick, M. (1992). Inter Office Memorandum to Director of Capital Projects, City of Houston from M. des Vignes-Kendrick, MD, MPH, Interim Director, Health and Human Services regarding Kennedy Heights Contaminated Soil Complaint, February 6, 1992.

¹⁹² In a summary of Water Project 10086, Pas-Key states that “Because the City had not transmitted to Pas-Key the promised test results, on January 22, 1992 Pas-Key submitted various soil samples to Dr. Edwin B. Smith, a consultant retained and paid by Pas-Key. Pas-Key Construction Service, Inc. (1992). Report on water project number 10086.

¹⁹³ A TNRCC official familiar with the Kennedy Heights investigation stated: “When we received the complaint in 1991 and went out and took a look at what was going on. Yeah, when the investigator actually got to the site, the excavation would have been for the placement of the water line and they had already filled that in when the investigator went out there. [If it had not been filled], it’s possible that there could have been a sample taken.” Interview with Texas Natural Resources Conservation Commission official, May 28, 2002, via telephone.

¹⁹⁴ Smith, E. B. (1992). Letter to Robert Paskey, Owner, Pas-Key Construction Service, Inc. from Edwin B. Smith, EFEH and Associates, January 29, 1992.

¹⁹⁵ Barnard, P. (1992). Letter to Robert Paskey, President, Pas-Key Construction Services, Inc. from Philip D. Barnard, P.E., Assistant Director, Capital Projects Department regarding Water Project #10086, March 20, 1992.

¹⁹⁶ John Hanby, the consultant hired by the Civic Association, found “extremely high levels of petroleum-related chemicals” in the soil, with concentrations “several times higher than the city’s highest reading.” B. Dawson and J. Robinson, Housing project site may be contaminated, *Houston Chronicle*, February 15, 1994, p. A-1.

¹⁹⁷ Rhyne, A. & Meyers, S. (1992). Interoffice memorandum to all laboratory personnel from Sheila Meyers and Anne Rhyne, Quality Assurance Specialists, Field Operations Division, September 3, 1992 (“The purpose of this letter is to inform the laboratories that the TWC will only accept method 418.1 from ‘Methods for Chemical Analysis of Water and Wastes’ as an acceptable method for analysis of Total Petroleum Hydrocarbon (TPH) of water, soil, and wastes...a decision has been made to withdraw ASTM method 3328-78-B as an acceptable method”).

¹⁹⁸ Prehmus, C.A. & Pickett, K.L. (1994). Proposal for phase I additional research and limited phase II – field sampling and laboratory testing program, Kennedy Heights subdivision, Houston, Texas, from Cynthia A. Prehmus, Project Environmental Scientist and Kendall L. Pickett, Principal, Law Engineering and Environmental Services to Sid Stephenson, American Home Dream Corporation, February 18, 1994.

¹⁹⁹ A survey taken by Simmons showed that there were 113 cases of cancer, brain tumors, lupus, and birth defects in the subdivision’s 325 homes. Cable News Network (1997). Houston residents sue Chevron over health problems. <http://www.cnn.com/US/9705/26/toxic.controversy/html>.

²⁰⁰ Flynn, G. & Dawson, B. (1995). Relocation of residents proposed: Kennedy Heights area contaminated. *Houston Chronicle*, August 8, 1995, p. A1.

²⁰¹ Over 200 letters were received by RRC, mostly in September. Most of the letters followed a similar format. Some included entirely unique portions, such as a letter sent by Anita Smith, a resident of Kennedy Heights:

We the residents in the Kennedy Heights subdivision area have relatives that have died. And we still have family, neighbors who are still dieing and we have children who are having liver, kidney, tumors, and heart problems. And there are more than just that of problems and a lot of residents

and their family are having. And we have some children who will not grow...I also have a four-year-old...ever since he was born he have had the liver problem he born with a piece of his liver missing. Please. We need your help bad get us out of here. The people of Kennedy Heights need help now.

²⁰² Tintera, J. (no date). Memorandum to Brenda Loudermilk, Special Counsel from John Tintera regarding Status of Kennedy Heights Investigation, Harris County, Texas.

²⁰³ In the EPA's final report on the site, it was indicated that "Methane has been reported at concentrations ranging from 25,000 to 480,000 ppm in samples collected by the residents' contractors." Ecology and Environment, Inc. (2001). Expanded Site Inspection Final Report, Kennedy Heights, Houston, Harris County, Texas, prepared for U.S. Environmental Protection Agency, Region 6, May 2001, p. 3-3.

²⁰⁴ Railroad Commission of Texas (1995). Kennedy Heights Chevron Methane Investigation Proposal RRC Comments, October 17, 1995 (Draft); Railroad Commission of Texas (1995). Kennedy Heights Summary, 11/95.

²⁰⁵ Ibid.

²⁰⁶ Railroad Commission of Texas Oil and Gas Division (1996). Comments on Chevron's Comprehensive Work Plan for Kennedy Heights Subdivision, Houston, Texas Dated October 23, 1996.

²⁰⁷ Tintera, J. (no date). Memorandum to Brenda Loudermilk, Special Counsel from John Tintera regarding Status of Kennedy Heights Investigation, Harris County, Texas.

²⁰⁸ Railroad Commission of Texas (1996). Summary of Residents Representatives Methane Comments, March 20, 1996.

²⁰⁹ Railroad Commission of Texas (1996). Kennedy Heights Residents Representatives Letter of 4/3/96.

²¹⁰ For example, meetings held in May and December, 1996 included only RRC, Chevron, and consulting firm representatives. RRC/Chevron Kennedy Heights Meeting, 5/13/96 Sign-in sheet; KH Chevron Technical Mtg., 12/6/95 Sign-in sheet.

²¹¹ Tintera, J. (1995). Electronic mail to Kennedy Heights listserv, December 21, 1995, 11:52 p.m. Some of the questions raised regarding split samples were whether Chevron would provide sample containers to RRC, whether they would be loaded under RRC observation, and whether Chevron would avoid RRC's personnel decontamination.

²¹² Tintera, J. (1995). Letter to Guy Grossman, District Director, Railroad Commission of Texas from John James Tintera, Assistant Director, Site Remediation, December 7, 1995.

²¹³ Boyt, J. (1995). Memorandum to Chairman Rylander, Commissioner Williamson, and Commissioner Matthews from Jeb Boyt, Staff Attorney, Railroad Commission of Texas, December 8, 1995.

²¹⁴ Schaible, B. (1995). Electronic mail to COMW.DEESJ, RED.BeshearD, White.ScottB, OG.Tinteraj, OG.EatonT from Brian Schaible regarding Kennedy Heights, December 8, 1995, 12:08 p.m.

²¹⁵ Tintera, J. (1995). Electronic mail to RED.KellyM, RED.BeshearD, COMW.DEESJ, COM.HACHTMA, CARLICKD, WrotenberyL, EatonT, RossC, and IC.SCHAIBLEB from John J. Tintera regarding Kennedy Heights Update, December 15, 1995, 3:42 p.m.

²¹⁶ Tintera, J. (1996). Electronic mail to KH from John J. Tintera regarding Kennedy Heights Status Update, January 10, 1996, 9:13 a.m.

²¹⁷ Tintera, J. (1995). Electronic mail to KH from John J. Tintera regarding Upcoming Activities at Kennedy Heights, December 21, 1995, 11:52 a.m.

²¹⁸ Correa, A. (1996). Electronic mail to MIERTSCHINW and OG:RRC:RRC.OG (TINTERAJ) from Art Correa regarding KH Core Lab Samples – Reply – Reply – Reply, January 17, 1996, 8:55 a.m.

²¹⁹ Correa, A. (1996). Electronic mail to MIERTSCHINW and OG:RRC:RRC.OG:TINTERAJ from Art Correa regarding KH Core Lab Samples – Reply – Reply – Reply, January 17, 1996, 9:28 a.m.

²²⁰ Ibid.

²²¹ Railroad Commission of Texas Oil and Gas Division (1996). Comments on Chevron's Comprehensive Work Plan for Kennedy Heights Subdivision, Houston, Texas Dated October 23, 1996.

²²² Correa, A. (1996). Electronic mail to MIERTSCHINW and TINTERAJ from Art Correa regarding KH, January 24, 1996, 2:33 p.m.

²²³ Tintera, J. (1996). Electronic mail to Kennedy Heights from John J. Tintera regarding Kennedy Heights Status Update, February 16, 1996, 8:35 a.m.

²²⁴ Tintera, J. (1996). Electronic mail to KH from John J. Tintera regarding Kennedy Heights Status Update, February 21, 1996, 2:48 p.m.

²²⁵ Exploration Technologies (1995). Bore Hole Locations, Pit Number 1, Prepared for O'Quinn, Kerensky, McAninch & Laminak, August 15, 1995.

²²⁶ Statewide Rule 91 criteria are for crude oil spills in "non-sensitive" areas and include the following requirements: removal of all free oil immediately according to SWR 91 guidelines, horizontal and vertical delineation of all areas with more than 1% TPH (10,000 ppm), and proper reporting. A much more involved process for addressing sensitive areas has been developed by RRC, called the Risk-Based Decision Making (RBDM) program. Railroad Commission of Texas (2001). Guidelines for Spills, Releases, and Risk Based Decision Making for Oil Field Related Sites in Texas, June 21, 2001.

²²⁷ Flynn, G. & Dawson, B. (1995). Relocation of residents proposed: Kennedy Heights area contaminated. *Houston Chronicle*, August 8, 1995, p. A1.

²²⁸ Ibid.

²²⁹ Railroad Commission of Texas (2001). Guidelines for Spills, Releases, and Risk Based Decision Making for Oil Field Related Sites in Texas, June 21, 2001.

²³⁰ Railroad Commission of Texas Oil and Gas Division (1996). Comments on Chevron's Comprehensive Work Plan for Kennedy Heights Subdivision, Houston, Texas Dated October 23, 1996.

²³¹ Correa, A. (1996). Electronic mail to MIERTSCHINW and TINTERAJ from Art Correa regarding Bids for KH Sampling, March 22, 1996, 10:41 a.m. ("As of 10:00 a.m. we have received three bids. The low bidder is a hub - Chemsolve from Austin. Bid is for \$481 for either fluid or soil samples. The amount we are authorized will limit us to 5 samples. Bids have been signed and amounts double checked for accuracy. Any suggestions on what criteria we can document to award it as lowest and best bidder. Bidding is officially closed at 10:10 a.m. after checking fax machine and with SR & SRT personnel from any other bids.")

²³² Flour Daniel GTI (1996). Comprehensive Work Plan for Kennedy Heights Subdivision, Houston, Texas, Third Draft, prepared for Chevron U.S.A. Production Company, October 18, 1996.

²³³ Bell, A. E. (1996). Letter to Terri Eaton, Assistant Director, Environmental Section, Railroad Commission of Texas, Office of General Counsel from Allen Eli Bell, Bernsen, Jamail and Goodson, L.L.P., June 4, 1996.

²³⁴ Ibid.

²³⁵ Tintera, J. (1996). Electronic mail to COMW.OG_GREENSHEET from John J. Tintera regarding Kennedy Heights Correspondence, May 9, 1996, 2:47 p.m.

²³⁶ Tintera, J. (1996). Electronic mail to COMW.OG_GREENSHEET from John J. Tintera regarding Kennedy Heights, May 23, 1996, 2:41 p.m.

²³⁷ Tintera, J. (1996). Electronic mail to EatonT, LG.JohnsonB, LG.FowlerL, SchieckD, Wrotenb... from John J. Tintera regarding Kennedy Heights Pre-Hearing Conference, November 17, 1996, 12:45 p.m.

²³⁸ Ibid.

²³⁹ Eaton, T. K. (1996). Letter to William-Paul Thomas, Chief of Staff, Office of Senator Rodney Ellis from Terri K. Eaton, Assistant Director, Environmental Section, Railroad Commission of Texas, Office of General Counsel, June 7, 1996.

²⁴⁰ For example, on March 23, 1999, roughly 2,400 plaintiffs met at the Hofheinz Pavilion basketball court at the University of Houston, and were again called upon to accept the settlement. Chambers' Plaintiffs' Response to Motion to Withdraw of John O'Quinn et al. from their Representation as their Counsel, *Adams et al. v. Chevron U.S.A., Inc.*, H-96-1462 (S.D. Tex. February 9, 2000). An attorney asked the group to pause and recite the Prayer for Serenity ("Lord, grant me the serenity to accept the things I cannot change, courage to change the things I can, and wisdom to know the difference."). Most residents were too broken to protest the choice that they would have to make: either accept their settlement, or be deemed *pro se* (representing themselves, should the court grant motions by O'Quinn and associates to withdraw as counsel) in a case that, should it proceed, will begin by considering strong challenges to Chevron's liability and the admissibility of evidence. O'Quinn, J. M. (2000). Letter to Client from John M. O'Quinn, O'Quinn & Laminack, July 28, 2000.

²⁴¹ Sampling frames concern how, for example, soil samples will be taken from a geographic area. Questions of timing, tools used, and horizontal and vertical spacing are considered in order to increase the likelihood that a contaminant, if present in the soil, will be detected and its location pinpointed.

²⁴² Interview of Pat Agostino, Exploration Technologies, Inc., via telephone.

²⁴³ Ibid.

- ²⁴⁴ Exploration Technologies (1995). Bore Hole Locations, Pit Number 1, Prepared for O'Quinn, Kerensky, McAninch & Laminak, August 15, 1995.
- ²⁴⁵ Interview with Staff Scientist, Exploration Technologies, Inc., via telephone.
- ²⁴⁶ Railroad Commission of Texas (1995). Handwritten field notes for December 13, 1995.
- ²⁴⁷ Interview with John Tintera, Railroad Commission of Texas, via telephone.
- ²⁴⁸ Tintera, J. (1995). Electronic mail to RED.KellyM, RED.BeshearD, COMW.DEESJ, COMW.HACHTMA from John J. Tintera regarding Kennedy Heights Update, December 15, 1995, 3:42 p.m.
- ²⁴⁹ Correa, A. (1996). Electronic mail to MIERTSCHINW, TINTERAJ from Art A. Correa regarding Kennedy Heights, April 4, 1996.
- ²⁵⁰ Brian Schaible (1995). Electronic mail to COMW.DEESJ, RED.BeshearD, White.ScottB from Brian Schaible regarding Kennedy Heights, December 8, 1995, 12:08 p.m.
- ²⁵¹ Railroad Commission of Texas (1996). 12/6/95 Meeting with Chevron. Handwritten notes to meeting.
- ²⁵² Tintera, J. (1995). Electronic mail to White.ScottB, COMW.DEESJ, RED.BeshearD from John J. Tintera regarding Kennedy Heights Inquiry, August 25, 1995, 11:33 a.m.
- ²⁵³ Correa, A. (1995). Electronic mail to MIERTSCHINW, TINTERAJ from Art A. Correa regarding Kennedy Heights, November 20, 1995, 4:11 p.m.
- ²⁵⁴ Correa, A. (1995). Electronic mail to MIERTSCHINW, OG:RRC:RRC.OG:TINTERAJ from Art A. Correa regarding Kennedy Heights – Reply – Reply, November 29, 1995, 11:57 a.m.
- ²⁵⁵ Tintera, J. (1995). Electronic mail to WrotenberyL, RossC, EatonT from John J. Tintera regarding KH Operations Mtg., December 7, 1995, 1:12 p.m.
- ²⁵⁶ Tintera, J. (1995). Electronic mail to kh from John J. Tintera regarding Kennedy Heights Update, December 28, 1995, 8:16 a.m.
- ²⁵⁷ Correa, A. (1996). Electronic mail to MIERTSCHINW, OG:RRC:RRC.OG(TINTERAJ) from Art A. Correa regarding KH Core Lab Samples – Reply – Reply – Reply, January 17, 1996, 8:55 a.m.
- ²⁵⁸ Correa, A. (1996). Electronic mail to MIERTSCHINW, TINTERAJ from Art A. Correa regarding KH, January 24, 1996, 2:33 p.m.
- ²⁵⁹ Beshear, D. (1996). Electronic mail to OG.TINTERAJ from David Beshear regarding KH, February 20, 1996, 5:27 p.m.
- ²⁶⁰ Tintera, J. (1996). Electronic mail to EatonT from John J. Tintera regarding KH, March 21, 1996, 8:31 a.m.
- ²⁶¹ Correa, A. (1996). Electronic mail to MIERTSCHINW, TINTERAJ from Art Correa regarding Bids for KH Sampling, March 22, 1996, 10:41 a.m.
- ²⁶² Renfro, B. (1996). Electronic mail to TinteraJ from Bill Renfro regarding Kennedy Heights Analysis, April 5, 1996, 4:40 p.m.
- ²⁶³ Tintera, J. (1996). Electronic mail to CorreaA from John J. Tintera regarding KH samples, May 9, 1996, 4:03 p.m.
- ²⁶⁴ Tintera, J. (1996). Electronic mail to EatonT from John J. Tintera regarding Kennedy Heights Response, April 8, 1996, 4:57 p.m.
- ²⁶⁵ Ibid.
- ²⁶⁶ Ibid.
- ²⁶⁷ Ibid.
- ²⁶⁸ Tintera, J. (1996). Electronic mail to IC.SCHAIBLEB from John J. Tintera regarding Remediation project info – Reply, April 4, 1996 10:19 a.m.
- ²⁶⁹ Tintera, J. (1996). Electronic mail to IC.LawsonS from John J. Tintera regarding Sen. Ellis Kennedy Heights Info Request (and attached answers to information request by Chief of Staff William Paul Thomas), March 27, 1996, 10:50 a.m.
- ²⁷⁰ Tintera, J. (1996). Electronic mail to EatonT, LG.JohnsonB, LG.FowlerL, SchieckD, Wrotenb... from John J. Tintera regarding Kennedy Heights Pre-Hearing Conference, November 17, 1996, 12:45 p.m.
- ²⁷¹ Compliance Solutions, Inc. (1997). Addendum to base line risk assessment for the Kennedy Heights subdivision (Houston, Texas), Prepared for Chevron USA Production Company, October 2, 1997.
- ²⁷² Ibid., 1.
- ²⁷³ Ibid., 2.
- ²⁷⁴ Ibid., 12.
- ²⁷⁵ Ibid., 3.

²⁷⁶ Ibid., 4.

²⁷⁷ Ibid.

²⁷⁸ Ibid., 5.

²⁷⁹ Ibid.

²⁸⁰ Ibid.

²⁸¹ Mathworks (2005). Statistics toolbox. Available at <http://www.mathworks.com/access/helpdesk/help/toolbox/stats/linea32a.html>.

²⁸² Dallal, G. (2000). Nonparametric statistics. Available at <http://www.tufts.edu/~gdallal/npar.htm>.

²⁸³ *Supra* note 271, at 6.

²⁸⁴ Texas Natural Resources Conservation Commission (2001). Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas. Prepared by Toxicology and Risk Assessment Section, December 2001.

²⁸⁵ 30 TAC § 350.71.

²⁸⁶ Texas Commission on Environmental Quality (2004). Regulatory guidance: Affected property assessment requirements. RG-366/TRRP-12, March 2004, p. 8.

²⁸⁷ 30 TAC §§350.4(a)(6), 350.51(m).

²⁸⁸ Ecology and Environment, Inc. (2001). Expanded Site Inspection, Final Report. Prepared for U.S. Environmental Protection Agency, Region 6, May 2001 at 2-3 (“However, the EPA has met with both City officials and the residents several times, and the residents’ concerns about their drinking water supply remain unresolved.”).

²⁸⁹ Ibid., 4-7 (“An attempt was made to capture enough of the NAPL to send for laboratory analysis, but there was not a sufficient quantity available for sample collection. A decision was made to go ahead and sample the well, which went dry during purge activities. The well was allowed to recover and a sample was collected for analysis.”).

²⁹⁰ Ibid., 5-2.

²⁹¹ Ibid.

²⁹² For much of this work, plaintiffs retained Charles Howard & Associates. Howard was a consultant to water, sewerage, and power utilities, as well as local, state, and federal governments across North America, in the development and use of computer techniques for water management. After taking field measurements of water pressure at various points across the distribution system in Kennedy Heights, Howard used EPANET, a computerized water distribution system simulation developed by the Environmental Protection Agency, to model the fate and transport of contaminants to plaintiffs’ homes. Howard, C.D. (1996). Letter to Carl D. Shaw, O’Quinn, Kerensky, McAninch & Laminack from Charles D. Howard, Charles Howard & Associates, Ltd., September 30, 1996. Based on the introduction of 1 g/m² of a contaminant to a hypothetical pipe break along the network, EPANET was modeled to provide estimates of contaminant concentrations at certain locations, given in maximum levels within each hour in mg/l over a 24-hour period. Assuming that contaminants entered the system during water main repairs, Howard modeled concentrations at various points along water pipes and at certain bellwether homes after a hypothetical repair at 11322 Murr Way or 11322 Lockgate Lane. His findings suggested that between .027 and 5.082 mg/L of contaminant would be found in pipe 4243, which delivered water to seven of the plaintiffs’ homes, over the course of a 24-hour period following introduction of the contaminant into a pipe at 11322 Murr Way. Plaintiffs also took water samples and samples of “oil floating on the surface of the water and entering a pipe during a pipe repair” after a pipe break at 11326 Lockgate Lane in September 1996. They found PAH concentrations of 2.4 ppm in the water and 7,826 ppm in the oil. Plaintiffs’ Summary of the Case, *Adams et al. v. Chevron U.S.A., Inc. et al.*, H-96-1462 (S.D. Tex. September 10, 1997).

²⁹³ Summary of the Case Submitted by Defendants, *Adams et al. v. Chevron U.S.A., Inc. et al.*, H-96-1462 (S.D. Tex. September 10, 1997).

²⁹⁴ Ibid.

²⁹⁵ Final Judgment, *Adams et al. v. Chevron U.S.A., Inc.*, H-96-1462 (S.D. Tex. October 1, 2002).

²⁹⁶ Order, *Adams et al. v. Chevron, U.S.A., Inc.*, H-96-1462 (S.D. Tex. September 22, 1997).

²⁹⁷ Ibid.

²⁹⁸ Interview with Plaintiffs’ Attorney, December 19, 2002, via telephone.

²⁹⁹ Agreed Order to Appoint Special Master, *Adams et al. v. Chevron U.S.A., Inc.*, H-96-1462 (S.D. Tex. April 21, 1998).

³⁰⁰ Status Hearing Before the Honorable David Hittner, *Adams et al. v. Chevron U.S.A., Inc.*, H-96-1462 (S.D. Tex. June 2, 1998), 6-7.

³⁰¹ Interview with Kennedy Heights residents, December 12, 2002, via telephone. Residents who reported that they were confident that the contamination posed no danger were not without their own stories of suspected contamination, such as “odor in our water that comes out of the faucet.”

³⁰² Jones, D. (1999). Letter to James Gaston, Chief of Staff, Office of U.S. Representative Sheila Jackson Lee from Kennedy Heights Plaintiff, October 18, 1999.

³⁰³ Interview with Kennedy Heights resident, April 20, 2002, in Houston, Texas.

³⁰⁴ *Supra* note 300.

³⁰⁵ Special Master’s Report, *Adams et al. v. Chevron U.S.A., Inc.*, H-96-1462 (S.D. Tex. March 24, 2000):

The Master, in reaching his allocation, has reviewed all of the relevant facts and circumstances in the case including, but not limited to, a determination of the address of each Plaintiff’s residents to establish whether their property was in the subdivision known as Kennedy Heights, and if so, the distance from Kennedy Heights, whether the Plaintiff was a real property owner, a relative to a real property owner or an unrelated visitor. Any real property determined to be within Kennedy Heights was further evaluated based on its location within Kennedy Heights. The Master further evaluated each Plaintiff’s award based on the length of time the plaintiff lived in Kennedy Heights and based on an examination of each Plaintiff’s medical records, questionnaires and interrogatories provided to the Master by the Plaintiff’s attorney and other factors.

³⁰⁶ Interview with Special Master, April 16, 2002, in Houston, Texas:

I was able to show Chevron based on objective evidence that houses built over a pit have less value than houses that are not built over a pit. And so I took data from the same or similar type of subdivisions and showed how much those houses were selling per square foot, and then I did a model which for 44 houses over the NE pit, I gave those people 100% of the value of their houses, it was like \$50,000.

³⁰⁷ Adams Plaintiffs, Kennedy Heights Litigation, Total Property Award map (no date), obtained from the special master of *Adams et al. v. Chevron U.S.A., Inc. et al.* during interview, April 16, 2002.

³⁰⁸ Adams Plaintiffs, Kennedy Heights Litigation, Total Personal Award map (no date), obtained from the special master of *Adams et al. v. Chevron U.S.A., Inc. et al.* during interview, April 16, 2002.

³⁰⁹ For a certain number of plaintiffs living over the NE pit, the settlement called for 100% acceptance.

Other groups had settlement requirements of various percentages below 100%.

³¹⁰ Master Settlement Agreement for Plaintiffs Represented by O’Quinn & Laminack, *Adams et al. v. Chevron U.S.A., Inc.*, H-96-1462 (S.D. Tex. July 28, 1999). Amounts were increased by the time the special master filed his report in March 2000. Special Master’s Report, *Adams et al. v. Chevron U.S.A., Inc.*, H-96-1462 (S.D. Tex. March 24, 2000).

³¹¹ Final Judgment, *Adams et al. v. Chevron U.S.A., Inc.*, H-96-1462 (S.D. Tex. October 1, 2002).

³¹² *Ibid.*

Notes to Chapter 4

³¹³ Interview of Member, Shoreline Environmental Alliance, May 31, 2002, via telephone.

³¹⁴ Interview of Crockett Resident, June 8, 2002, in Crockett.

³¹⁵ The uncracker complex converts a wide variety of feed stocks into lower-molecular-weight products using a hydrocracking process. In this process, feed, gas oil, and hydrogen at high pressure and temperature are contacted with catalyst which induce desulfurization, denitrogenation, and hydrocracking. The hydrogen for the process is produced by the steam-gas reforming process in which the feed gas (i.e., propane) and superheated steam are passed over a catalyst at high temperature. To prevent catalyst poisoning, the hydrogen gas must be purified by the removal of CO₂. Catacarb is used to absorb CO₂.

³¹⁶ Director of Enforcement, Bay Area Air Quality Management District (1994). Unocal refinery 8/22/94-9/6/94 Catacarb Release Office Memorandum to Air Pollution Control Officer, September 23, 1994.

³¹⁷ Unocal Corporation (1995). Unocal Material Safety Data Sheet: Catacarb. February 6, 1995.

³¹⁸ Burnson, R. (1994). Residents sue Unocal for \$1 billion over leaks. *Contra Costa Times*, September 23, 1994, p. 1. Health problems mentioned by residents during interviews included gastrointestinal problems, skin reactions, eye dysfunction, nerve damage (including some which led to root canals), memory loss,

numbness, loss of feeling in fingers, post-traumatic stress, and chronic fatigue. These ailments were mentioned in interviews with residents of Crockett, Rodeo, Tormey, and Bayo Vista. See also Hunt, K. (1994). Hundreds suffer after toxic gas leak. *San Francisco Examiner*, December 18, 1994, p. C-7 (“Jane Strike went blind. Vickie Wood will give birth to a stillborn child and doesn’t know if the twin she also carries will be healthy. Leanna Devy has had fainting spells for two months. All three are convinced their problems began with a toxic chemical leak at a nearby Unocal refinery that went unabated for more than two weeks last summer.”). Indeed, a study released in March 1996 suggested that residents of Crockett suffered nearly double the rates of eye problems, memory loss, and anxiety as a control community. Bowler, R. (1996). Health study of a community exposed to a chemical spill: Final report of the Crockett Health Study. San Francisco State University, March 29, 1996.

³¹⁹ Public records requests to the District Attorney for Contra Costa County and the Bay Area Air Quality Management District yielded no documents other than initial complaints and consent decrees. I was told that interview transcripts and related documents would have been destroyed as they were more than five years old.

³²⁰ Contra Costa County (1994). Response to Comments Document for the Unocal Corporation Reformulated Gasoline Project, Land Use Permit 2038-93, September, 1994.

³²¹ Contra Costa County Planning Commission (1994). Agenda Item #6, Tuesday, November 15, 1994, Unocal Corporation (Applicant and Owner).

³²² Hallissy, E. (1997). Unocal will settle suits for \$80 million. *San Francisco Chronicle*, April 15, 1997, p. A-1.

³²³ *San Francisco Examiner* (1996). Off the ticker. *San Francisco Examiner*, November 19, 1996, p. C-1.

³²⁴ Interview of Member, Shoreline Environmental Alliance, May 31, 2002, via telephone.

³²⁵ Burress, C. (1993). Crockett Power Gets Panel Approval. *San Francisco Chronicle*, July 30, 1993, p. A22.

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³²⁷ Bancroft, A. (1993). Crockett Power Plant Approved: Foes say they will Appeal State Energy Commission’s Decision. *San Francisco Chronicle*, April 27, 1993, p. A16.

³²⁸ A non-profit environmental advocacy group composed of organizers, scientists, and attorneys, CBE became aware of the nexus between race and environmental quality issues through its research of the Richmond, CA community in the late 1980’s. Its scientists analyzed each of the environmental impact reports issued for the purpose of complying with reformulated fuels regulations, starting with Shell Oil in Martinez.

³²⁹ Woody, T. (1995). Sixteen long days of delay and indifference. *The Recorder*, October 4, 1995, p. 17.

³³⁰ *Ibid.*

³³¹ *Ibid.*

³³² Bay Area Air Quality Management District (1994). Incident Report Number Three: Unocal Corporation – Refinery. September 9, 1994.

³³³ *West County Times* (1994). Anger over leak. *West County Times*, September 23, 1994, p. 1.

³³⁴ Unocal Corporation San Francisco Refinery (no date). Chronology of events, Catacarb incident.

³³⁵ Stein, G. (1989). Two refineries win awards for job safety. *Los Angeles Times*, April 30, 1989, p. 12.

³³⁶ Hunt, K. (1995). Why leak went unchecked: Bay decisions, fearful employees added up to letting release of toxic mist go on for 16 days. *San Francisco Examiner*, April 16, 1995, p. C-5.

³³⁷ Woody, T. (1995). Sixteen long days of delay and indifference. *The Recorder*, October 4, 1995, p. 17.

³³⁸ Decision to extend run length cites.

³³⁹ For this chapter, deposition transcripts for 21 interviews with refinery workers were coded for worker activities, decisions, and actions during the two week release period. Their actions were then divided into themes, which guided a second read of their depictions of the accident. Each theme represents an area of activity or organizational design responsible in part for the extension of the leak at the refinery. Acting in combination, they represent the root causes of the severity of the Catacarb release and its effects on neighboring communities.

³⁴⁰ Interview with Stephen Plesh, General Manager, Unocal San Francisco Refinery, July 17, 1996. Deposition in re Unocal Refinery Litigation, in the Superior Court of the State of California, Contra Costa County, Case No. 94-04141.

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- ³⁴¹ Interview with Thomas Carroll, Superintendent of Maintenance, Unocal San Francisco Refinery, May 16, 1996. Deposition in re Unocal Refinery Litigation, in the Superior Court of the State of California, Contra Costa County, Case No. 94-04141.
- ³⁴² Interview with Vijay Malhotra, Corrosion Engineer, Unocal San Francisco Refinery, May 22, 1996. Deposition in re Unocal Refinery Litigation, in the Superior Court of the State of California, Contra Costa County, Case No. 94-04141.
- ³⁴³ Interview with Dale Iverson, Advisor, Environmental Programs, Unocal San Francisco Refinery, May 28, 1996. Deposition in re Unocal Refinery Litigation, in the Superior Court of the State of California, Contra Costa County, Case No. 94-04141.
- ³⁴⁴ *Supra* note 341.
- ³⁴⁵ Interview with Morgan Clark, General Superintendent of Operations, Unocal San Francisco Refinery, July 8, 1996. Deposition in re Unocal Refinery Litigation, in the Superior Court of the State of California, Contra Costa County, Case No. 94-04141.
- ³⁴⁶ Interviewees differed widely in the extent to which they viewed the D-409 tower before the meeting.
- ³⁴⁷ Interview with David Willson, Fire Protection Shift Supervisor, Unocal San Francisco Refinery, February 13, 1996. Deposition in re Unocal Refinery Litigation, in the Superior Court of the State of California, Contra Costa County, Case No. 94-04141.
- ³⁴⁸ *Supra* note 345.
- ³⁴⁹ *Supra* note 340.
- ³⁵⁰ Interview with Lanny Partain, Shift Supervisor, Unocal San Francisco Refinery, May 23, 1996. Deposition in re Unocal Refinery Litigation, in the Superior Court of the State of California, Contra Costa County, Case No. 94-04141.
- ³⁵¹ Interview with Ellen Barker, Hydrotreating Engineer, Unocal San Francisco Refinery, June 24, 1996. Deposition in re Unocal Refinery Litigation, in the Superior Court of the State of California, Contra Costa County, Case No. 94-04141.
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- ³⁵³ *Supra* note 350; see also Unocal Petroleum Products and Chemicals Division, San Francisco Refinery (1994). Process hazard analysis: Unicracking unit 240, hydrogen production section – Plant 4, February, 1994; Unocal San Francisco Refinery (1994). San Francisco Refinery policies and procedures manual: MOC and pre-startup safety review procedures, February 1, 1994.
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- ³⁵⁵ *Supra* note 350.
- ³⁵⁶ *Supra* note 340.
- ³⁵⁷ *Supra* note 341.
- ³⁵⁸ Interview with Donald Young, Shift Supervisor, Unocal San Francisco Refinery, May 2, 1996. Deposition in re Unocal Refinery Litigation, in the Superior Court of the State of California, Contra Costa County, Case No. 94-04141.
- ³⁵⁹ Interview with Diane Wang, Senior Operator, Unocal San Francisco Refinery, February 26, 1996. Deposition in re Unocal Refinery Litigation, in the Superior Court of the State of California, Contra Costa County, Case No. 94-04141.
- ³⁶⁰ Interview with Joe Fernandez, Operator, Unocal San Francisco Refinery, April 23, 1996. Deposition in re Unocal Refinery Litigation, in the Superior Court of the State of California, Contra Costa County, Case No. 94-04141.
- ³⁶¹ *Ibid.*
- ³⁶² Interview with Adrien Van de Hoef, Bulk Shift Supervisor, Unocal San Francisco Refinery, July 17, 1996. Deposition in re Unocal Refinery Litigation, in the Superior Court of the State of California, Contra Costa County, Case No. 94-04141.
- ³⁶³ *Supra* note 345.
- ³⁶⁴ *Ibid.*
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- ³⁶⁹ *Supra* note 354.
- ³⁷⁰ *Supra* note 360.
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- ³⁷⁴ *Ibid.*
- ³⁷⁵ Interview with Gary Martin, Plant 4 Operator, Unocal San Francisco Refinery, April 16, 1996. Deposition in re Unocal Refinery Litigation, in the Superior Court of the State of California, Contra Costa County, Case No. 94-04141.
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⁴³⁴ The communities of Globeville, Elyria, Swansea, Cole, and Clayton currently constitute the “Vasquez Boulevard/I-70 Site,” 450 acres in northeast Denver proposed to the National Priorities List (NPL) on January 19, 1999. Within this area, roughly 17,500 people reside in about 5,126 housing units according to the 2000 census. At least 69% of the people in the study area are of Hispanic origin, 21% are African-American, and 3% are American Indian, Alaskan Native, Asian, or Hawaiian. Inside and immediately surrounding the proposed Superfund site are roughly 150 industrial land uses including four NPL sites, three lead smelters, two oil refineries, and numerous RCRA (hazardous waste) sites. Much of the area is contaminated with soil concentrations of lead, arsenic, and zinc well above what is considered safe by the federal government. Interstate 70, which split Swansea and Elyria in half when it was constructed in the mid-1960’s, rises high above these communities on viaducts. The state Transportation Department has considered expanding the highway to as many as ten lanes.

⁴³⁵ The Conoco Refinery has the capacity to process approximately 57,500 barrels of oil per day. The refining process involves separating hydrocarbons from crude oil and converting them into products. Crude oil, which contains a variety of toxins and impurities (such as sulfur), is first heated in a distillation column. This process causes various gasses to rise through the distillation column where they cool down and form liquids that move through piping and are used for various products (fractional distillation): heavy oils condense at the lower level of the column and are used for domestic heating oil, lighter products gather at the middle level and are used for gasoline and kerosene, and some are unable to condense and pass into a vapor recovery unit. The latter are then processed through a process called cracking (the application of either heat or chemicals). A number of toxic substances are released at various stages of the process, such as volatile organic compounds like benzene, toluene, and xylene. Conoco ranked among the highest producers of toxic air emissions in Colorado at the time of this study.

⁴³⁶ Lorraine Granado, a plaintiff and head of the Cross Community Coalition, lived five blocks from the refinery with two sons at the time. Michael Maes, a plaintiff and head of United Swansea, also lived within the area most immediately impacted by Conoco’s violations.

⁴³⁷ Jerry Heyd, Refinery Manager, Conoco to Hugh Davidson, Air Pollution Control Division, CDPHE, RE: Tri-County/APCD meetings with Conoco on August 13 and 29, 1996, September 12, 1996. ADD

⁴³⁸ Complaint, COPIRG Citizen Lobby, Lorraine Granado, and Michael Maes v. Conoco, Inc., CA 98-30 (N.Co. 1998).

⁴³⁹ Air campaign seeks ballot spot, *Rocky Mountain News*, March 12, 1992; Tough clean-air bill wins approval, *Rocky Mountain News*, May 6, 1992.

⁴⁴⁰ See Concept A-1: Elements of a Colorado Air Toxics Strategy, COPIRG Discussion Draft, April 14, 1992; Overview of Hazardous Waste Pollutant APEN Reporting, COPIRG, Denver, CO.

⁴⁴¹ Interview with former COPIRG President, March 4, 2002, in Denver.

⁴⁴² Ibid.

⁴⁴³ In 1998, Public Service Company released 18,228 tons of sulfur dioxide while Conoco released 2,498 tons into the atmosphere.

⁴⁴⁴ Interview with former attorney, Land and Water Fund of the Rockies, March 6, 2002, in Boulder.

⁴⁴⁵ Ibid.

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⁴⁴⁷ Jerry Heyd, Refinery Manager to Bob Jorgenson, Colorado Department of Health, Re: Claus Sulfur Recovery Unit NSPS Subpart J Applicability, September 24, 1993.

⁴⁴⁸ Ibid.

⁴⁴⁹ CDPHE estimates can be found in Robert Jorgenson to Dave Ouimette Re: Conoco problems with Sulfur Plants, Inter-Office Communication, October 17, 1996.

⁴⁵⁰ Adapted from Randall Weiner to COPIRG Citizen Lobby, Proposed Litigation, October 5, 1997.

⁴⁵¹ *Supra* note 441.

⁴⁵² Interview with Swansea resident, March 8, 2002, in Swansea.

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- ⁴⁶³ Compliance Order on Consent, 98-08-07-02, RCRA (2008)-VIII-98-03, In the matter of Conoco, Inc., August 7, 1998.
- ⁴⁶⁴ Complaint, COPIRG Citizen Lobby, Lorraine Granado, and Michael Maes v. Conoco, Inc., CA 98-30 (N. Co. 1998).
- ⁴⁶⁵ Conoco, Inc.’s First Motion for Accelerated Decision, No. 97-03 In the matter of Conoco, Inc., June 6, 1997; Conoco, Inc.’s Second Motion for Accelerated Decision, No. 97-03 In the matter of Conoco, Inc., June 6, 1997.
- ⁴⁶⁶ Inter-office communication from Robert Jorgenson to Dave Ouimette of CDPHE RE: Conoco problems with the sulfur plants, October 17, 1996; Jay Christopher, Air Program Leader, Conoco to Dave Ouimette, Air Pollution Control Division, CDPHE RE: Conoco Denver refinery, SO₂ issues, March 20, 1997.
- ⁴⁶⁷ Jerry Heyd, Refinery Manager to Hugh Davidson, Air Pollution Control Division, Re: Tri-county/APCD Meetings with Conoco on August 13 and August 29, 1996, September 12, 1996.
- ⁴⁶⁸ Compliance Order on Consent Number 98-08-07-02, RCRA (3008)-VIII-98-03, In the matter of Conoco, Inc., August 7, 1998.
- ⁴⁶⁹ *Supra* note 464.
- ⁴⁷⁰ This section was based on Interview of Environmental Director, Conoco Refinery, March 7, 2001 in Commerce City and Interview of Air Program Leader, Conoco Refinery, March 22, 2001 via telephone.
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- ⁴⁷² *Ibid* (Air Program Leader).
- ⁴⁷³ Notice of Lodging of Consent Decree under the Clean Air Act, Federal Register, 67(17): 3735 (January 25, 2002).
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- ⁴⁷⁶ Notice from ADR Judge, RCRA (3008) VIII-97-03, In the matter of Conoco, Inc., July 2, 1997.
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- ⁴⁸⁵ Interview of Mediator, April 4, 2002 via telephone.

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- ⁴⁸⁶ Draft Settlement Discussions between COPIRG and Conoco, March 10, 1998, 9:00 a.m. to 12:00 noon, Suggested Meeting Agenda.
- ⁴⁸⁷ Draft Settlement Discussions between COPIRG and Conoco, March 10, 1998, 9:00 a.m. to 12:00 noon, Responsibilities of the Parties.
- ⁴⁸⁸ Minutes of Settlement Discussions, March 31, 1998, between COPIRG and Conoco.
- ⁴⁸⁹ Settlement Discussions Between COPIRG and Conoco, March 30, 1998, 9:00 a.m. to 12:00 noon, Meeting Agenda.
- ⁴⁹⁰ Meeting with Randy Weiner, Michael Mae, Lorraine Granado on April 7, 1998.
- ⁴⁹¹ Interview of Swansea Resident, March 5, 2002 in Denver.
- ⁴⁹² *Supra* note 444.
- ⁴⁹³ *Supra* note 452.
- ⁴⁹⁴ Settlement Agreement and Release between COPIRG Citizen Lobby, Michael Maes, Lorraine Granado, and Conoco, Inc., April 29, 1999.
- ⁴⁹⁵ Consent Order, RCRA (3008) VIII-97-03 in the matter of Conoco, Inc., August 11, 1998; Compliance Order on Consent, RCRA (3008) VIII-98-03 in the matter of Conoco, Inc., August 7, 1998.
- ⁴⁹⁶ *Ibid.*
- ⁴⁹⁷ *See* Quarterly Status Reports, Docket Numbers RCRA (3008) VIII-97-03 and RCRA (3008) VIII-98-03, Conoco Sulfur Dioxide Emissions Reduction Project.
- ⁴⁹⁸ Brenda Morris, Legal Enforcement Program, US EPA Region VIII to Thomas Meyers, Environmental Director, Conoco, Inc., March 17, 1999.
- ⁴⁹⁹ Brian Lever, Refinery Leader, to John Works, Technical Enforcement Program, EPA Region VIII, Re: Sulfur Reductions SEP Completion Report, Docket Numbers RCRA (3008) VIII-97-03 and RCRA (3008) VIII-98-03, June 29, 2001
- ⁵⁰⁰ *Ibid.*
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- ⁵²⁷ G. DeSanctis and M. Poole, Capturing the complexity in advanced technology use: Adaptive structuration theory, *Organization Science* 5 (1994): 121; *supra* note 508.
- ⁵²⁸ *Supra* note 525, 634.
- ⁵²⁹ *Ibid.*
- ⁵³⁰ *Ibid.*, 630.
- ⁵³¹ *Ibid.*, 634.
- ⁵³² *Ibid.*, 630.