BEFORE THE

NEW MEXICO ENERGY, MINERALS AND NATURAL RESOURCES

OIL CONSERVATION COMMISSION

IN THE MATTER OF THE APPLICATION OF
PUBLIC SERVICE COMPANY OF NEW MEXICO
FOR REVIEW OF OIL CONSERVATION DIVISION
DIRECTIVE DATED MARCH 13, 1998
DIRECTING APPLICANT TO PERFORM
ADDITIONAL REMEDIATION FOR
HYDROCARBON CONTAMINATION,
SAN JUAN BASIN, NEW MEXICO CASE NO. 12033

DIRECT TESTIMONY OF

TONI K. RISTAU

MARUEEN GANNON

RODNEY HEATH

MARK SIKELIANOS

VALDA I. TERAUDS

SUBMITTED ON BEHALF OF

PUBLIC SERVICE COMPANY OF NEW MEXICO

APPLICANT

JULY 9, 1999

BEFORE THE

NEW MEXICO ENERGY, MINERALS AND NATURAL RESOURCES

OIL CONSERVATION COMMISSION

**IN THE MATTER OF THE APPLICATION OF
PUBLIC SERVICE COMPANY OF NEW MEXICO
FOR REVIEW OF OIL CONSERVATION DIVISION
DIRECTIVE DATED MARCH 13, 1998
DIRECTING APPLICANT TO PERFORM
ADDITIONAL REMEDIATION FOR
HYDROCARBON CONTAMINATION,
SAN JUAN BASIN, NEW MEXICO CASE NO. 12033**

DIRECT TESTIMONY OF

TONI K. RISTAU

SUBMITTED ON BEHALF OF

PUBLIC SERVICE COMPANY OF NEW MEXICO

APPLICANT

JULY 9, 1999

OCC CASE NO. 12033
DIRECT TESTIMONY OF
TONI K. RISTAU

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Toni K. Ristau. My business address is Public Service Company of New Mexico ("PNM"), Alvarado Square, MS-0408, Albuquerque, New Mexico, 87158.

Q. UPON WHOSE BEHALF ARE YOU SUBMITTING TESTIMONY?

A. I am submitting this testimony on behalf of PNM. For clarification on the record, some exhibits may refer to PNM Gas Services and Gas Company of New Mexico. PNM Gas Services is an unincorporated division of PNM. Gas Company of New Mexico was the name of the same division prior to its name change.

Q. WHAT IS YOUR POSITION WITH PNM, AND WHAT ARE YOUR PRIMARY JOB RESPONSIBILITIES?

A. In August 1993, I accepted employment with PNM as Director of Environmental Services. My duties include overall management of PNM's environmental programs, including remediation and corrective action at sites in New Mexico. I supervise a staff of 21 environmental science and engineering professionals and support personnel.

Q. WHAT DOES THIS APPEAL INVOLVE?

A. This appeal involves a determination by the New Mexico Oil Conservation Division ("OCD") that PNM is responsible for the investigation and clean-up of

free product underlying the Hampton 4M well which is located in the San Juan Basin. The OCD has erroneously determined that certain free product and associated dissolved phase hydrocarbons in the ground water are the result of discharges from a dehydrator to a former unlined pit on the Hampton 4M well pad.

Q. CAN YOU TELL US THE PURPOSE OF YOUR TESTIMONY?

A. First, I will introduce the other witnesses presenting testimony in this proceeding on behalf of PNM and will provide a brief description of their testimony in this case. Second, I will provide the historical and regulatory background for this appeal Third I will state the basis for PNM's appeal and the relief sought. Fourth, I will discuss PNM's obligation as a public utility to provide reliable service to its customers. Fifth, I will address the contractual provisions relating to PNM's purchase of gas from Burlington and the ownership of the free product. Sixth I will address the OCD's practice with regard to the allocation of responsibility for investigation and clean up of contamination at other similar sites.

Q. CAN YOU PLEASE TELL THE COMMISSION ABOUT YOUR EDUCATIONAL BACKGROUND AND EXPERIENCE IN THE ENVIRONMENTAL FIELD.

A. I hold an undergraduate degree (bachelor of arts) from the University of

Minnesota, in architecture, with an emphasis in historic preservation, granted in 1971. I also have a masters of science degree in environmental health engineering, conferred by Northwestern University in 1979. I have a juris doctorate degree from University of Denver Law School, granted in 1984.

Q. DO YOU HAVE SPECIFIC EXPERIENCE WITH RESPECT TO ENVIRONMENTAL INVESTIGATIONS AND REMEDIATION?

A. Yes. I have 28 years of experience in various environmental and conservation fields overall, and about 15 years of experience specifically related to remediation and environmental-contamination issues. My first in-depth familiarity with environmental site investigations and remediation was during my tenure as acting director for the CERCLA (or Superfund) Bureau for the State of Utah Division of Environmental Health. The Division was a part of the Utah Department of Health, a state agency, and we worked mainly with site investigations or remedial investigation/feasibility studies at Superfund sites. The major environmental issues at these sites were usually related to groundwater contamination.

My next position was with an architectural/engineering consulting firm, EBASCO, on remediation investigations and projects. The client base was largely Department of Defense installations, and my remediation investigation work and corrective action/permitting work (under the authorities of the

Resource Conservation and Recovery Act, or RCRA) was at the Rocky Mountain Arsenal in Denver, Colorado, Dugway Proving Ground in Utah, and several Army depots and ammunition production plants located across the country.

I also worked for a consulting company, Geosciences Consultants Ltd., in Albuquerque, New Mexico, as their southwest regional director. My duties included supervision and oversight of the work of about 60 geosciences professionals (geologists, hydrologists, hydrogeologists, environmental scientists, and engineers), particularly for remediation activities related to groundwater contamination in New Mexico and the southwestern part of the U.S. I also provided consulting services to clients on permitting, remediation, and other regulatory compliance issues, including specifically natural gas operations in the state of New Mexico.

I then took a position with a small start-up consulting firm in Denver, Colorado, AGEISS Environmental, as their director of environmental services. The bulk of the technical work of the office was, at that time, related to groundwater, soils, surface water, and biota contamination issues at the Rocky Mountain Arsenal and Dugway Proving Ground. I worked with AGEISS until I accepted my current position with PNM in 1993.

Q. DO YOU HAVE DAY-TO-DAY INVOLVEMENT IN THE VARIOUS

ENVIRONMENTAL PROJECTS THAT ARE BEING UNDERTAKEN BY PNM?

A. Yes. PNM is very active on both the remediation and compliance fronts, and I work with our staff, as a team, on our strategies, with particular emphasis on assuring that we meet regulatory requirements and maintain high quality in our environmental compliance and remediation efforts. Our aim is to have the best possible approach from both an environmental science and regulatory compliance standpoint.

Q. HAVE YOU HAD ANY EXPERIENCE WITH REGARD TO REMEDIATION ACTIVITIES, PARTICULARLY THOSE RELATED TO THE OIL AND GAS INDUSTRY?

A. Yes, I have, both as an outside consultant and with PNM. One of my first assignments after accepting employment with PNM was to evaluate the OCD and BLM cease-discharge orders and to develop an approach for evaluating and remediating the unlined surface impoundments located within the designated vulnerable areas in the San Juan basin.

Q. HAVE YOU TESTIFIED BEFORE THE OIL CONSERVATION COMMISSION ("OCC" OR "COMMISSION") PREVIOUSLY?

A. Yes. I provided informal testimony or comments at hearings on two or three occasions, and I also provided formal testimony in support of the adoption of the

OCC abatement regulations. I also provided testimony in the previous hearing related to the Hampton 4M groundwater contamination issues, though that testimony was provided before a hearing examiner and not before the Commission. During that testimony, I was accepted as an expert witness in ground water contamination and remediation matters.

Q. CAN YOU PLEASE INTRODUCE THE OTHER WITNESSES PRESENTING TESTIMONY ON BEHALF OF PNM AND GIVE THE COMMISSION A BRIEF DESCRIPTION OF THEIR TESTIMONY?

A. Yes. The next witness to present testimony on behalf of PNM is PNM Witness Maureen Gannon. Ms. Gannon is Project Manager for PNM's pit remediation project. Her testimony will discuss the history of PNM's investigation and remediation efforts at the Hampton 4M well site and PNM's experience at other former pit sites.

PNM Witness Rodney Heath will then address the operational aspects of the oil field surface equipment at the Hampton 4M well, including PNM's former dehydrator and Burlington's equipment. Mr. Heath will address the likelihood of whether large volumes of free product could have been discharged to ground water from PNM's former dehydration pit. Mr. Heath also notes an apparent and unexplained anomaly relating to Burlington's gas and oil production ratios.

PNM Witness Mark Sikelianos is a senior technician in PNM's Environmental

Services Department. He will testify concerning his personal observations at the Hampton 4M well site and Burlington's remediation efforts.

Finally, PNM Witness Valda Terauds, an outside consultant with Mission Research Corporation, will provide testimony that demonstrates that the free product at the Hampton 4M site originated upgradient from PNM's former dehydration pit, that the volumes of free product underlying the site are far in excess of what could have come from PNM's former pit and that Burlington's remediation efforts have not been effective.

Q. **CAN YOU PLEASE PROVIDE SOME HISTORICAL BACKGROUND AND THE REGULATORY FRAMEWORK LEADING UP TO THE ISSUES IN THIS PROCEEDING?**

A. Yes. As I am sure the Commission knows, the production of natural gas generally results in the generation of certain by-products. These by-products can include such things as produced water as well as free product. Until just a few years ago, it was very common for entities involved in oil field operations to discharge certain amounts of these by-products to unlined earthen pits at or near the well pad. Generally, the producers tried to capture the free product in tanks because it can be sold and has monetary value.

PNM had operations at a number of wells, including the Hampton 4M well site, where it operated dehydrators. These dehydrators were intended to remove

moisture from the gas. The moisture removed from the gas was discharged for a time to unlined earthen pits at the well pad.

Q. DID ANYTHING HAPPEN TO CHANGE THE PRACTICE OF DISCHARGING TO UNLINED PITS?

A. Yes. The oil and gas industry has generally enjoyed significant exemptions from environmental statutes. However, as environmental awareness has increased over the years, concern about discharges into unlined pits from oil field operations also increased. This concern culminated in the issuance of OCC Order R-7940-C on January 14, 1993 ("OCC Order").

Q. ARE YOU FAMILIAR WITH THE REQUIREMENTS OF THE OCC ORDER?

A. Yes. The OCC Order requires operators to cease discharge and to submit plans for obtaining closure of the unlined surface impoundments to the OCD and the Bureau of Land Management ("BLM") for approval, and establishes guidelines for determining whether levels of hydrocarbon contamination in soils have been reduced sufficiently to close the pit.

Q. DOES THE OCC ORDER ESTABLISH SPECIFIC DEADLINES FOR PIT CLOSURE OR FOR REMEDIATION OF SOILS OR GROUNDWATER?

A. The OCC Order established specific deadlines for cessation of discharge into

unlined pits. The OCC Order generally allows operators to make their own determination on when to close a pit at an operating well, but requires the operator at the site to evaluate and close pits within 45 days of plugging and abandonment of the well. The "operator" referred to in the OCC Order is the producer, or the operator of the oil and gas well. The deadline for closure of any pits at a site is tied to the cessation of production at a site, not the cessation of discharge.

Q. WITH REGARD TO THE HAMPTON 4M SITE, DO YOU HAVE AN UNDERSTANDING AS TO THE CURRENT OWNERSHIP OF THE WELL?

A. I believe that Burlington is the lessee and operator at the Hampton 4M well. The Hampton 4M is located on a federal lease on land managed by the BLM. I understand from records relating to the Hampton 4M well that Burlington is a successor in interest to Meridian and Southland Royalty Company

Q. DOES PNM HOLD ANY LANDS, LEASES OR RIGHTS-OF-WAY AT THE HAMPTON 4M SITE?

A. PNM has never been the lessee, nor has PNM ever held a working or royalty interest in the well or lease. PNM did have an easement or license to allow PNM access to the property to gather the gas. However, PNM has never operated the well or any equipment associated with the production of natural gas

or hydrocarbon liquids from the well. PNM has, in the past, only owned and operated dehydrators and maintained metering equipment at the site.

Q. SINCE PNM IS NOT THE "OPERATOR" AT ANY SITE, INCLUDING THE HAMPTON 4M SITE, WHY IS PNM EVALUATING, REMEDIATING, AND CLOSING PITS AT THIS TIME?

A. Unlike many of the operators in the San Juan basin, PNM has elected to take a pro-active approach and to evaluate and close pits before such activity is absolutely required by the regulatory authorities. Also, as a part of PNM's sale of its gas gathering and processing operations in the San Juan Basin to Williams Gas Processing - Blanco, Inc. ("Williams"), PNM agreed to continue its activities related to pit evaluation and remediation, which were initiated prior to the sale of the gathering and processing assets in 1995.

Q. PLEASE PROVIDE MORE DETAIL REGARDING THE CONTRACTUAL RELATIONSHIP BETWEEN PNM AND WILLIAMS REGARDING REMEDIATION OR CLEANUP OF PIT CONTAMINATION.

A. As a part of the sale of these gas gathering assets to Williams June 30, 1995, PNM agreed to continue with the pit closure activities that had been initiated prior to the sale. PNM, as part of this contractual arrangement with Williams, agreed to comply with OCC Order R-7940-C regarding cessation of discharge.

PNM also, as part of a closing agreement, agreed to close pits within the OCC-designated vulnerable areas, including remediation of contaminated soils and groundwater as required by applicable regulations, and that may have occurred as a result of PNM's operations at a site prior to June 30, 1995.

Q. HAS PNM OPERATED THE DEYHDRATOR OR ANY SURFACE EQUIPMENT AT THE HAMPTON 4M WELL SITE SINCE JUNE 30, 1995?

A. PNM has not.

Q. DID PNM'S AGREEMENT WITH WILLIAMS REQUIRE PNM TO PROVIDE INDEMNIFICATION WITHOUT REGARD TO WHETHER PNM WAS RESPONSIBLE IN SOME WAY FOR THE CONTAMINATION IN THE FIRST PLACE?

A. No. PNM only agreed to take care of contamination resulting from PNM's operations prior to June 30, 1995. Anything that happened after that date is Williams' responsibility. PNM did not indemnify Williams for continuing compliance, but only for matters directly related to PNM's past operations. In addition, PNM did not agree to indemnify anyone other than Williams; i.e., the indemnification does not extend to unrelated third-parties, such as Burlington.

Q. WHEN DID PNM INITIATE WORK TO ACHIEVE COMPLIANCE WITH THE OCC ORDER?

A. The PNM cease-discharge and pit evaluation and closure program has been ongoing since the OCC Order was issued. It was initiated by PNM staff prior to my arrival at PNM in late 1993, and has been ongoing since that time.

Q. IF, STRICTLY SPEAKING, SOILS AND GROUNDWATER CLEANUP IS NOT REQUIRED OF OPERATORS SUCH AS PNM BY THE OCC ORDER, WHAT REQUIREMENTS ARE IN PLACE THAT REQUIRE SUCH CLEANUP?

A. There are no regulatory authorities requiring cleanup of contaminated soils, unless the soils may release contamination to ground and surface waters. At most sites in the San Juan Basin, the major water contamination issues associated with the operation of dehydration equipment are related to groundwater contamination, not surface water contamination. In these instances, there are abatement regulations that establish cleanup requirements for contaminated soils in the vadose zone and for the contaminated groundwater itself.

Q. HAS ANY REGULATORY BODY OR AUTHORITY PROMULGATED ABATEMENT REGULATIONS THAT APPLY TO OIL AND GAS ACTIVITIES?

A. Initially, abatement regulations were promulgated by the New Mexico Water Quality Control Commission ("WQCC"), and the OCD was, as a constituent

agency, responsible for enforcing the regulatory requirements. Subsequently, the OCC promulgated abatement regulations that are similar to the WQCC regulations, but that are tailored to the special considerations of the oil and gas industry in New Mexico.

Q. WHAT INVOLVEMENT HAVE YOU HAD IN THE DEVELOPMENT OF AND COMPLIANCE WITH THE WQCC ABATEMENT REGULATIONS?

A. For the development of the WQCC abatement regulations, I drafted written comments and provided both oral and written testimony on the regulations during the promulgation process.

Q. DID YOU HAVE ANY INVOLVEMENT IN THE DEVELOPMENT OF THE OCC ABATEMENT REGULATIONS THAT HAVE NOW SUPERSEDED, IN PART, THE APPLICATION OF THE WQCC REGULATIONS FOR GROUNDWATER CONTAMINATION RESULTING FROM OIL AND GAS OPERATIONS AND ACTIVITIES?

A. Yes. I served on the OCC rulemaking committee that was charged with the task of drafting the OCC abatement regulations, which are modeled on the WQCC abatement regulations but are tailored to address the special needs and considerations of the oil and gas industry in this state.

Q. UNDER THE STATE OF NEW MEXICO REGULATIONS, WHO IS

RESPONSIBLE FOR CLEANUP OR ABATEMENT OF GROUNDWATER CONTAMINATION?

A. My understanding is that the person responsible for the cleanup or abatement of contamination is the person who released the materials to the environment.

Q. IS IT YOUR UNDERSTANDING, THEN, THAT IF YOU ARE OWNER OR OPERATOR AT A SITE AND YOU DISCOVER CONTAMINATION BENEATH THAT SITE, YOU ARE IN ALL CASES RESPONSIBLE FOR THE CLEANUP OF THOSE CONTAMINANTS?

A. No. My understanding is that the person or operator who discharged or released the contaminants is responsible for the cleanup.

Q. IS IT YOUR UNDERSTANDING THAT THE GROUNDWATER CLEANUP REGULATIONS ARE MODELED ON THE SUPERFUND LIABILITY SCHEME, WHICH IMPOSES STRICT, JOINT AND SEVERAL LIABILITY UPON FOUR CLASSES OF OWNER/OPERATORS AT A SITE?

A. No. From my participation in the development of both the WQCC and OCC regulations, my understanding is that the Superfund scheme of strict liability, as well as joint and several liability was specifically rejected as not being in conformance with the New Mexico Water Quality Act, which identifies the person who released the contaminants as the party responsible for cleaning them

up.

Q. WHY ARE THE CURRENT ACTIVITIES AT THE HAMPTON 4M SITE NOT PROCEEDING UNDER THE ABATEMENT REGULATIONS?

A. Both the WQCC and the OCC abatement regulations provide for "grandfathering" of remediation or abatement activities that were initiated prior to the effective date of the regulations, provided those activities are conducted pursuant to a plan approved by the OCD and the entity responsible for implementing the plan is continuing to make progress in remediation. PNM is conducting its remediation activities pursuant to a "grandfathered" plan. In the case of soils remediation, the written plan is the work plan that was submitted to and approved by the OCD and the BLM related to compliance with the OCC Order. In the case of groundwater remediation, PNM conducts its activities pursuant to PNM's Groundwater Management Plan, which was submitted to and approved by the OCD prior to the initiation by PNM of groundwater remediation activities in the San Juan Basin.

Q. WHY DID PNM SUPPLEMENT ITS GROUNDWATER MANAGEMENT PLAN WITH A SITE-SPECIFIC PLAN AT THE HAMPTON 4M SITE?

A. The PNM Groundwater Management Plan deals with the vast majority of sites that are typical sites, but indicates that, in atypical cases, site-specific plans will be submitted as appropriate.

Q. DO YOU CONSIDER THE HAMPTON 4M SITE AS "ATYPICAL"?

A. Yes. Unlike all other sites that PNM has remediated where the dehydrator was the only source of contamination, we are seeing large volumes of free phase product, and we are seeing an increase in dissolved phase contamination over time, even after the PNM pit has been remediated.

Q. WHAT DO ALL OF THE FACTORS YOU HAVE MENTIONED INDICATE TO YOU?

A. These factors, taken as a whole, indicate to me that there are substantial, continuing sources or releases of free product at this site that have not yet been characterized and addressed, and that these source areas or release points are not associated with PNM's former operations or discharge pit at the site. As these factors are quite complex, and interplay strongly with each other to lead to this conclusion, we have prepared an exhibit that summarizes them (see PNM Exhibit 1). The individual factors will be addressed in greater detail by PNM's other technical witnesses, Maureen Gannon, Mark Sikelianos, Rodney Heath, and Valda Terauds.

Q. DOES BURLINGTON HAVE A GROUNDWATER MANAGEMENT PLAN IN PLACE?

A. Yes, Burlington has a Groundwater Management Plan that is modeled on PNM's groundwater management plan.

Q. WHEN WAS BURLINGTON'S PLAN SUBMITTED TO THE OCD?

A. Burlington's plan was submitted to the OCD in August 1998.

Q. WHAT WAS THE EFFECTIVE DATE OF THE OCC ABATEMENT REGULATIONS?

A. The effective date of the OCC abatement regulations was March 15, 1997.

Q. WAS BURLINGTON'S PLAN SUBMITTED SUBSEQUENT TO THAT DATE?

A. Yes.

Q. WHAT IS THE EFFECT OF NOT HAVING A GRANDFATHERED PLAN?

A. Investigation and remediation should then be carried out under the OCC abatement regulations as opposed to a plan.

Q. DOES BURLINGTON'S GROUNDWATER MANAGEMENT PLAN ALSO HAVE PROVISIONS FOR SITE-SPECIFIC PLANS FOR "ATYPICAL" SITES?

A. Yes. In fact, in Ed Hasely's (Burlington's) letter to the OCD transmitting Burlington's Groundwater Investigation and Remediation Plan for the San Juan Basin to the OCD dated August 6, 1998 , a true and correct copy of which is attached as PNM Exhibit 2, states: " . . . Sites falling outside the scope of this plan due to complexity or associated risk will be handled on an individual basis

with site specific plans approved by the New Mexico Oil Conservation Division."

Q. WOULD YOU CONSIDER THE HAMPTON 4M SITE TO BE ONE THAT WOULD FALL OUTSIDE THE "GENERIC" PLAN DUE TO COMPLEXITY OR ASSOCIATED RISK?

A. Yes. There is a risk of offsite contamination at the Hampton 4M site. This is evidenced by the OCD Letter of March 11, 1998 to Dr. Everett Burton. A true and correct copy of the letter is attached as PNM Exhibit 3. The risk of off site contamination is greater at this site than at the typical San Juan Basin site. Also, the Hampton 4M site is more complex than the typical site, as there is free-phase product present, the dissolved phase contamination is not trending downward over time, and there is a source or sources that have yet to be characterized and addressed at the site.

Q. DID BURLINGTON SUBMIT A WRITTEN SITE-SPECIFIC REMEDIATION WORKPLAN TO THE OCD FOR APPROVAL SUBSEQUENT TO SUBMITTAL OF THEIR GROUNDWATER MANAGEMENT PLAN AND PRIOR TO COMMENCING REMEDIAL ACTIVITIES AT THE HAMPTON 4M SITE?

A. Not to my knowledge, no.

Q. HAVE YOU EVER BEEN TO THE HAMPTON 4M SITE, AND VIEWED

THE AREA YOURSELF?

A. Yes, I have been there a number of times.

Q. DO YOU HAVE ANY EXHIBITS WHICH DEPICT THE LAYOUTS OF THE HAMPTON 4M WELL PAD AT VARIOUS POINTS IN TIME?

A. Yes. PNM Exhibit 4 shows the basic layout of the site prior to 1998 when the well was a dual completion well. The equipment visible on the well pad shows that at the time this photo was taken, the well was still a dual-completion well and had not been commingled. PNM's former unlined pit was at the northern edge of the well pad. This exhibit shows that the cease-discharge tank was set slightly to the south and west of where the former pit was located, near the northern edge of the well pad. At the time this photograph was taken, the dehydrator discharge from Williams' operations went to the cease-discharge tank that was set by PNM. Burlington's cease-discharge tank was located to the south of their separators at the time this photograph was taken. Burlington's product tanks, which were moved when the well was commingled, are located to the east of their separators, near the southern end of the well pad.

Q. CAN YOU PLEASE TELL US WHAT PNM EXHIBIT 5 SHOWS?

A. PNM Exhibit 5 shows the layout of the well pad after the well was commingled in early 1998. After the commingling of the well, there was only one separator and only one dehydrator on site. In addition, after the well was converted to a

dual completion well, Burlington maintained only one product tank for storage of free product from the well. This tank was located to the west of Burlington's separator. The Burlington's discharge tank remained to the south of its separator.

Q. HAVE THERE BEEN MODIFICATIONS TO THE WELL PAD SINCE PNM EXHIBIT 5 WAS PREPARED?

A. Yes. During November 1998 through February of 1999, Burlington undertook a massive excavation in and around the area of PNM's former pit on the northern end of the well pad. This excavation resulted in the destruction of PNM's recovery well at MW-2 and most of PNM's other monitoring wells on the well pad. PNM Exhibit 6 shows the general area of Burlington's excavation. This exhibit shows that PNM's former dehydrator and meter house have been displaced from their former locations by the excavation. PNM Exhibit 6 also shows the current location of Burlington's surface equipment.

Q. CAN YOU PLEASE SUMMARIZE THE FACTS LEADING UP TO PNM'S PRESENT APPEAL BEFORE THE COMMISSION?

A. Yes. PNM conducted its initial site assessment at the Hampton 4M well in April of 1996. That is the same time when cease discharge at this site was achieved by shutting in the dehydrator, and then setting a tank. PNM initiated pit remediation at this site by excavation of the soils in PNM's former dehydration

pit. Because of physical constraints at the well pad, PNM was not able to remove all known contaminated soils. In instances where contaminated soils cannot be removed for some reason, vertical drilling in the former pit location is required to ascertain the vertical extent of the contamination. PNM performed the vertical drilling at the Hampton 4M site in December of 1996. Ground water was encountered at approximately 28 feet below surface. Approximately two inches of free product was observed in the well bailer. PNM completed this vertical drilling as monitoring well MW-2. PNM provided written notice of the presence of the free product to the OCD and Burlington by letter dated January 13, 1997, a true and correct copy of which is attached as PNM Exhibit 7. Test results for MW-2 taken on January 29, 1997 showed more than four feet of free product on the ground water.

Q. WHAT IS THE SIGNIFICANCE OF THIS FINDING?

A. It shows that there was a considerable amount of free product on the water table under the Hampton 4M well pad. In accordance with its approved Ground Water Management Plan and in consultation with the OCD, PNM initiated further investigation and remediation measures at this site. PNM installed additional monitoring wells, both on the Hampton 4M well pad and in areas off the well pad. PNM also initiated recovery of free product from the ground water through MW-6, a product recovery well. The specific details of these measures

are addressed in the testimony of PNM Witnesses Maureen Gannon and Valda Terauds.

WHAT DID THE DATA DEVELOPED FROM THE ADDITIONAL MONITORING WELLS SHOW ABOUT THE POSSIBLE SOURCE OF THE FREE PRODUCT IN THE GROUND WATER AT THE SITE?

A. The specific details of the findings from the monitoring wells are found in the testimony of PNM Witness Gannon and the significance of those findings are addressed by PNM Witness Valda Terauds. However, to summarize the results of the additional work, it became clear that the free product underlying PNM's former dehydration pit originated from some source or sources upgradient of PNM's former dehydration pit. Through the installation of the additional monitoring wells, PNM was able to clearly establish that the ground water gradient under the well pad flowed in a northerly or northwesterly direction from the area of Burlington's operations to the area of PNM's former dehydration pit. The ground water gradient flow is shown in PNM Exhibit 8.

Q. WERE YOU ABLE TO DRAW ANY CONCLUSIONS ABOUT THE VOLUME OF THE FREE PRODUCT UNDER THE WELL PAD SITE?

A. Yes. PNM initiated free product recovery through MW-6 in January of 1998. In other words, PNM pumped the free product from the top of the water table to the surface where it was collected in a drum. Burlington in turn collected, as its

own, the free product recovered by PNM. PNM continued to measure product thickness in the area of its former pit through MW-2. After an initial reduction in product thickness by about two feet, the product thickness remained relatively constant at about two feet. This shows either a continuing source or sources of free product, or a very large volume of free product, or both.

Q. DID PNM APPRISE THE OCD OF THE RESULTS OF ITS MONITORING WELLS AND PRODUCT RECOVERY ACTIVITIES?

A. Yes. PNN provided quarterly reports to both the OCD and Burlington about the results of PNM's investigation and remediation work. PNM also provided correspondence detailing its activities and findings to the OCD and Burlington. These documents are exhibits to the testimony of PNM Witness Gannon. PNM also had meetings with OCD and Burlington representatives where these matters were discussed.

Q. WHAT WAS BURLINGTON DOING AT THE HAMPTON 4M SITE DURING THIS TIME FRAME?

A. In April 1997 Burlington discovered a water seep just off the northwestern part of the well pad. The seep had evidence of free product. Burlington installed a trench to catch water from the seep. Burlington also conducted a partial excavation near the area of its former tank discharge pit. A few soil borings were also installed and a few temporary and monitoring wells were installed.

Many of these wells and borings were positive for contamination. The details of these activities are addressed in the testimony of PNM Witnesses Gannon and Sikelianos.

Q. WHAT WAS THE RULING OR FINDING OF THE OCD THAT PNM INITIALLY APPEALED?

A. In August of 1997 the OCD drew an imaginary "line in the sand" on the well pad between PNM's former operations and Burlington's operations. This line in the sand roughly corresponds with a line just to the north of the locations of TPW-1, TPW-2 and TPW-3 depicted in PNM Exhibit 9. The OCD ruled that Burlington was responsible for soil and ground water contamination on the well pad south (upgradient) of the line. PNM was ruled responsible for soil and groundwater contamination for the area north (downgradient) of the imaginary line, including all free product and all off-site dissolved phase product in the ground water. By letter dated March 13, 1998, a copy of which is found at PNM Exhibit 10, the OCD directed PNM to "take additional remedial action with 30 days to remove the remaining source areas with free phase hydrocarbons [free product] in the vicinity of and immediately downgradient of the dehy pit." It is this letter that prompted the initial appeal.

Q. DID THE OCD'S "LINE IN THE SAND" HAVE THE EFFECT OF APPORTIONING LIABILITY FOR INVESTIGATION AND

REMEDIATION AT THE HAMPTON 4M SITE?

A. Yes. The OCD's "line in the sand" was a clear apportionment of liability as between PNM and Burlington. The OCD directed Burlington to investigate the areas to the south (upgradient) of that line, and PNM to investigate the areas to the north (downgradient) of the line. This ruling apportioned a very small area to Burlington to investigate and/or remediate, and left the rest of the well pad and an undetermined amount of area upgradient from the well pad for PNM to investigate and remediate.

Q. HAS BURLINGTON CONDUCTED AN INVESTIGATION OF THEIR PORTION OF THE SITE, SIMILAR TO THE INVESTIGATIONS PERFORMED BY PNM?

A. Not really. Burlington has continued to focus its investigative and remediation efforts on the portion of the site that was designated by the OCD as PNM's responsibility, and has yet to conduct an investigation or remediation efforts similar to the intensity with which the PNM portion of the site has been investigated on their own portion of the site, i.e., the portion of the site that was designated as Burlington's responsibility by the OCD.

Q. ON THE ISSUE OF APPORTIONMENT, DID YOU CONSIDER THE OCD'S APPORTIONMENT TO BE A REASONABLE APPORTIONMENT OF RESPONSIBILITY BASED UPON THE

INVESTIGATIVE EFFORTS CONDUCTED AT THIS SITE?

A. We did not consider this to be a reasonable apportionment, especially as we performed more investigations and developed more data indicating that there was either a massive volume of free product located in the subsurface upgradient of PNM's former operations, or a continuing or intermittent upgradient release of free product, or both. The physical location of the surface equipment does not necessarily have any relationship to the source of ground water contamination. The contamination moves with the flow of the ground water. Therefore, contamination may originate at some point upgradient and travel to another location down gradient. This is what has happened at the Hampton 4M site. As we developed this additional data, it became apparent that the only effective way to eliminate the free phase contamination was to identify the upgradient release point or points, and cut them off. PNM had no rights of access to Burlington's operations and was precluded from interfering with ongoing operations at the site by Burlington and Williams.

Q. WHAT FACTORS WOULD LEAD YOU TO BELIEVE THAT THERE WAS MORE THAN ONE RELEASE POINT OF CONTAMINATION OF GROUNDWATER AT A SITE, THAT THE RELEASE DID NOT ORIGINATE FROM PNM OPERATIONS, OR THAT THERE IS AN ONGOING RELEASE PROBLEM?

A. First, if free product is present on the groundwater at a site, it is highly likely that the dehydrator pit was not the source or release point of contamination at a site. PNM's former operations at the site involved dehydration. Dehydrators remove and discharge wastewater with small amounts of hydrocarbon contamination in the wastewater to the soil; they do not discharge liquid hydrocarbons to groundwater. If large amounts of liquid hydrocarbons are sent to a dehydrator, it causes the dehydrator to malfunction and to shut down. If there are any significant amounts of liquid hydrocarbons in the discharge pit or tank from a dehydrator, it is because the producer's equipment upstream has malfunctioned and has sent liquid hydrocarbons to/through the dehydrator, or the liquid hydrocarbons have bypassed the dehydrator and have been discharged to the dehydrator pit or tank by the producer's upstream equipment.

Second, if free product appears at a site after the commencement of monitoring following the second remediation of the area of PNM's former pit, or if the thickness of free product does not diminish substantially over time, this constitutes strong evidence of a continuing or intermittent release of liquid hydrocarbons to the subsurface by operations or entities other than PNM. Similarly, if the BTEX ratios shift, with benzene as a proportionally higher percentage over time, there is likely a new source or release at the site that cannot possibly be attributable to PNM.

Finally, with regard to dissolved phase contamination, as was noted above, if there is free product present on the groundwater, the concentrations of dissolved phase hydrocarbon constituents (particularly benzene) will always be substantially above standards. If there is only one release point or source of dissolved phase contamination at a site (such as contaminated soils in a pit), if that suspected source is removed or remediated to below the OCD guidelines, the concentrations of dissolved phase hydrocarbon contaminants, particularly benzene, will drop over time. Thus, if the concentrations do not drop or actually rise, there is very likely another source of contamination at or near the site that is causing groundwater contamination.

Q. WHICH OF THESE FACTORS ARE PRESENT THAT WOULD LEAD YOU TO BELIEVE THAT THE SOURCE OF FREE PRODUCT AND DISSOLVED PHASE CONTAMINATION IS OTHER THAN THE DEHYDRATOR PIT AT THE HAMPTON 4M SITE?

A. All of them.

Q. WHY DID PNM DECIDE TO APPEAL THE INITIAL APPORTIONMENT DETERMINATION BY THE OCD?

A. PNM has a very strong policy of complying with OCD orders and undertaking activities that we think are most likely to achieve a maximum positive result for the environment as quickly as possible. However, the OCD's apportionment

decision was not well-grounded in either science or the law, and left PNM in the position of having to abate a release that PNM had not caused and over which PNM had no control.

Q. WHAT WAS THE OUTCOME OF THE INITIAL APPEAL TO THE OCD AS TO THE APPORTIONMENT ISSUE?

A. After the hearing in November 1998, the hearing examiner recognized that Burlington was a source of free product underlying the Hampton 4M well pad. However, the hearing examiner once again apportioned responsibility for investigation and clean-up of the free product and dissolved phase in the ground water. Rather than consider the evidence that PNM introduced concerning the fact that it was highly improbable that PNM could have contributed to the free product, the hearing examiner simply ruled that both PNM and Burlington were equally responsible for investigation and remediation of the ground water. Again, there is simply no scientific evidence or legal basis to sustain such an apportionment. Thus, PNM had no choice but to seek a *de novo* appeal of this determination to the Commission.

Q. WHAT ARE THE GROUNDS FOR PNM'S PRESENT APPEAL TO THE COMMISSION?

A. The grounds for PNM's appeal are set forth in PNM's Application and Request for *De Novo* Appeal on Order No. R-11134 which is PNM Exhibit 11. The

basic grounds for PNM's appeal are that: 1) PNM's former unlined pit is not the source for any free phase product in the groundwater under the site; 2) the data show that the free phase product underlying the Hampton 4M well pad originated at a release point or points upgradient of PNM's former dehydration pit; 3) PNM is not the owner of any free product under the site; 4) to the extent that free product may have been discharged into PNM's former unlined pit it was the result of operational or mechanical failure of Burlington's upgradient equipment and operations; 5) PNM has already recovered more free product from the ground water than could have possibly been discharged through its former unlined pit under any reasonable scenario; 6) all soil contamination underlying PNM's former unlined pit that was potentially a result of discharges from PNM operations was removed, and any additional contamination that has occurred in the area has been conveyed there from upgradient release points/sources and/or from discharges from equipment that is not owned, operated, or controlled by PNM; and 7) the OCD has no authority to require PNM to submit a remediation plan as PNM has already submitted and received approval of its Closure Plan and Groundwater Management Program, and has been in compliance with the provisions of those plans.

Q. WHAT RELIEF IS PNM REQUESTING FROM THE COMMISSION IN THIS HEARING?

A. PNM is seeking the following relief: 1) A ruling by the OCC that all soil contamination in the area of PNM's former pit has been remediated and that

PNM shall have no further responsibility for soil contamination at the site; 2) a ruling that PNM is not a responsible party for any free product underlying the Hampton 4M site or for the associated dissolved phase product in the vicinity of the site; 3) a ruling granting PNM closure for it former unlined pit at the Hampton 4M site and relief from any further responsibility for investigation and remediation at this site

Q. YOU PREVIOUSLY INDICATED THAT THE HEARING EXAMINER'S DECISION IS NOT BASED ON SCIENCE OR THE LAW. WHAT FACTS DO YOU HAVE THAT THE DECISION IS NOT BASED ON SCIENCE?

A. This aspect of our case is addressed in more detail by PNM Witness Valda Terauds. However, as discussed above, the evidence clearly shows that the free product originated from a source/release point upgradient of PNM's former pit and had migrated to the vicinity of PNM's former pit, where it was initially discovered by PNM. Moreover, the volume of free product is much greater than could possibly have come through PNM's former pit. The allocation does not take any of these factors into account. Finally, the evidence also demonstrates the presence of a continuing sources or sources at the site. Unless and until the source or sources of the free product are identified and addressed, PNM's remediation efforts would be of no effect. PNM would be relegated to

very expensive and potentially unending liability for remediation of free product which it did not release and which it is not releasing to the environment.

Q. HOW IS THE HEARING EXAMINER'S RULING LEGALLY ERRONEOUS?

A. The hearing examiner's ruling is legally erroneous in several respects. First, PNM does not even own the free product which is under the well pad site. As discussed later in my testimony, the product is owned by Burlington. Second, the ruling ignores the fact that PNM had no control over free product reaching its former dehydrator. Burlington and it predecessors were the entities in control of the free product. This is addressed in detail by PNM Witness Rodney Heath. Third, the applicable environmental statutes do not impose strict liability or joint and several liability for contamination at sites. Rather, liability is to be based on whether a party caused the subject contamination. PNM did not cause the free product contamination and resultant dissolved phase contamination in this instance. Fourth, OCD practice and policy has been to impose liability on current operators rather than past operators. In this case, Burlington and Williams are the current operators at the Hampton 4M well site. Therefore, the OCD's directives should be aimed at these parties and not against PNM.

Q. WHY DOES PNM CONTEND THAT IT IS NOT THE OWNER OF THE FREE PRODUCT?

A. PNM has been a gas utility since January 1985, when PNM purchased what is now PNM Gas Services operations from Southern Union Company. PNM contracted to purchase natural gas free of deleterious liquids or commercially free of liquids (sometimes this is expressed as a qualitative statement, and sometimes a gas quality specification is included). The point is that PNM purchased the natural gas, not the liquids.

Q. WAS PNM IN THE BUSINESS OF PURCHASING FREE PRODUCT OR HYDROCARBON LIQUIDS AT THIS SITE?

A. No, not to my knowledge.

Q. AT WHAT POINT DOES TITLE TO THE GAS PASS FROM THE PRODUCER TO PNM?

A. My understanding is that under the gas purchase contracts that were in effect at the time that PNM owned and operated dehydration equipment at the site, PNM took title and control of the gas at the meter orifice, downstream of the dehydrator, upstream of the gathering system.

Q. DO YOU HAVE AN UNDERSTANDING AS TO WHO IT IS THAT CLAIMS OWNERSHIP OF FREE-PRODUCT HYDROCARBONS WITH REGARD TO PRODUCTION FACILITIES WHERE A GAS COMPANY IS PURCHASING NATURAL GAS?

A. Yes, my understanding is that the producer on the site is the one who claims

ownership of those fluids.

Q. DOES THE PRODUCER RECEIVE AN ECONOMIC BENEFIT FROM THESE FLUIDS?

A. Yes, they do.

Q. DOES PNM RECEIVE AN ECONOMIC BENEFIT FROM THESE FLUIDS?

A. No, it did not. In fact, under the contracts in effect when PNM still owned and/or operated the gathering system and associated dehydration equipment, my understanding is that PNM was precluded by the contract from recovering any substantial amount of hydrocarbon liquids and from selling any such liquids that it might recover.

Q. HAS PNM EVER CLAIMED ANY OWNERSHIP IN THE FREE PRODUCT AT THE HAMPTON 4M SITE?

A. Not to my knowledge. For example, the free product that PNM was recovering during remediation was turned over to Burlington, as the producer has the ownership of and the right to hydrocarbon liquids produced from a gas well, absent any agreement to the contrary.

Q. DOES PNM, AS A PUBLIC UTILITY, HAVE TO MEET ANY SPECIAL OBLIGATIONS REGARDING THE DELIVERY OF THE GAS?

A. Yes. Because PNM has a duty to serve as a public utility, the gas that PNM

receives to transport to its customers must be free of deleterious liquids so that we won't have operational difficulties that could impair our ability to serve our customers. This obligation to serve is absolute; PNM cannot simply say "sorry – the quality of the gas we are receiving today is such that it can not be delivered to you, the customer."

Q. DOES PNM TAKE ANY STEPS TO ASSURE THAT IT CAN MEET THE OBLIGATION TO SERVE THAT IS IMPOSED UPON IT AND OTHER PUBLIC UTILITIES?

A. Yes. PNM imposes a gas quality specification upon the producers. Further, in order to protect our gas gathering and transportation system and to make sure that operations continue during the time of year when delivery of the gas was most crucial to our customers, PNM installed dehydration equipment ahead of the meter at this site to remove water vapor and trace amounts of hydrocarbons.

Q. PLEASE IDENTIFY PNM EXHIBIT 12.

A. Exhibit 12 is entitled "Gas Purchase Agreement between Southland Royalty and Gas Company of New Mexico".

Q. IS THIS A TRUE AND CORRECT COPY OF THE GAS PURCHASE AGREEMENT BETWEEN SOUTHLAND ROYALTY AND GAS COMPANY OF NEW MEXICO WHICH RELATES TO GAS PURCHASES BY PNM FROM THE HAMPTON 4M WELL?

A. To the best of my knowledge, yes.

Q. FOR WHAT PURPOSE IS THIS CONTRACT BEING OFFERED?

A. This contract (PNM Exhibit 12) addresses the specifications of the quality of the gas that was purchased by PNM and delineates the condition or standards that gas was required to meet at the delivery point (i.e., the delivery of the gas to the gatherer from the producer). The quality specification states that the gas is to be free of objectionable liquids. It also addresses the ownership and operation of the dehydration units at the Hampton 4M site.

Q. DOES THE CONTRACT (PNM EXHIBIT 12) ADDRESS WHO OWNS THE DEHYDRATOR UNIT AND WHO OPERATES IT?

A. Yes. Please see page 20, Section XI, which is entitled "Quality", and the specifications deal specifically with liquids. It says, "The gas shall be free of objectionable liquids." It also states that gas from new subject wells "...shall contain not more than seven pounds of water vapor per million cubic feet." It also contains a provision stating: "If in Buyer's sole judgment the gas deliverable from any Subject Well other than a New Subject Well contains sufficient moisture to require installation of dehydration equipment, such equipment shall be installed, maintained and operated by Buyer..." [which would have been Gas Company of New Mexico at this point in time] "...at Buyer's sole expense, except that all gas required as fuel for such equipment shall be taken upstream at

Buyer's meter, shall not be metered to Buyer hereunder and shall be free of cost to Buyer."

Q. WHY IS THE GAS QUALITY SPECIFICATION, AND THE OWNERSHIP OF THE LIQUIDS, IMPORTANT IN DETERMINING WHO IS RESPONSIBLE FOR THE FREE PRODUCT RELEASES AND GROUNDWATER CONTAMINATION AT THE HAMPTON 4M SITE?

A. PNM was purchasing gas only, and had no ownership in or control over the substances that were released to and contaminated the groundwater at the Hampton 4M site.

Q. WHY WOULD PNM INSTALL AND OPERATE DEHYDRATORS AT THIS SITE?

A. PNM installed dehydration units to remove moisture from the gas and to help assure gas quality. As discussed in more detail in PNM Witness Heath's testimony, moisture can cause operational problems and cause damage to systems or their safe operation. As also noted by PNM Witness Heath, the dehydrators are intended to address moisture, not free product.

Q. WHAT IS YOUR UNDERSTANDING OF THE NATURE OF LIABILITY IMPOSED UNDER THE NEW MEXICO STATUTES RELATING TO LIABILITY FOR INVESTIGATION AND REMEDIATION OF GROUND WATER CONTAMINATION AT OIL FIELD SITES?

A. As note above, I was very involved in the development and promulgation of both the WQCC and OCC abatement regulations. As a result of my participation in this process, I know that the New Mexico water quality protection requirements are not strict liability statutes. Unlike, for example, the federal CERCLA, or Superfund law, the New Mexico statutes and rules do not make every person who is associated with a site jointly and severally liable for any and all of the contamination, whether or not they released the substances. The statutes are intended to impose liability on the entity causing the contamination.

Q. IS THERE ANY REQUIREMENT UNDER PNM'S PIT-CLOSURE PLAN THAT PNM PROCEED WITH CLEANUP, REGARDLESS OF THE SOURCE OF THE CONTAMINATION?

A. No.

Q. ARE YOU FAMILIAR WITH HOW THE OCD HAS ASSIGNED PRIMARY RESPONSIBILITY FOR GROUND WATER INVESTIGATION AND CLEAN UP AT OTHER SITES?

A. Yes, I have had this issue investigated. In instances where PNM is not involved, the OCD pursues the current producer and equipment operators. The OCD is departing from its usual practice and procedure in this case. If the OCD were applying the law consistently, it would be pursuing Burlington and Williams as

the current operators at the site, not PNM.

Q. GIVEN YOUR EXPERIENCE AT CONTAMINATED SITES, DO YOU BELIEVE THAT PNM CAN EFFECTIVELY CONTINUE TO REMEDIATE THIS SITE?

A. At this point in time, Burlington has completely removed any remaining soil materials from PNM's former pit down to and into the water table in the vicinity of PNM's former pit. Because PNM has had no active gas gathering operations at the Hampton 4M site since June 30, 1995, any remaining free product (or other) contamination at the site could not possibly be as a result of PNM discharges. PNM has no ability or authority to go onto other operators' sites or interfere in any way with other operators' operations, absent an explicit invitation or approval from such entities. Thus, PNM has no way of investigating or locating, let alone addressing, the other source areas and continuing releases at the Hampton 4M site. Thus, PNM cannot effectively remediate the obvious contamination originating upgradient of its former pit. However, it is important to note that PNM has reinstalled a monitoring well in the vicinity of its former dehydration pit and is monitoring the ground water quality in accordance with its groundwater management plan to help ensure that the environment is protected to the maximum extent possible. However, as any future issues at the site cannot possibly be associated with PNM's activities at

this site, and as PNM no longer has active operations and has completely remediated any increment of pollution or contamination that its operations (and, in fact, the entire area surrounding PNM's former pit has been completely removed), PNM can no longer effectively remediate the site.

Q. HAVE YOU REVIEWED THE DOCUMENTATION AND DATA PRESENTED BY PNM AS EXHIBITS RELATING TO PRESENCE OF FREE PRODUCT CONTAMINATION IN THE GROUND WATER UNDERLYING THE HAMPTON 4M WELL?

A. Yes I have.

Q. HAVE YOU REVIEWED THE TESTIMONY AND OPINIONS PRESENTED BY PNM WITNESS VALDA TERAUDS IN THIS PROCEEDING?

A. Yes I have.

Q. DO YOU AGREE WITH HER OPINIONS CONCERNING THE SOURCE OF FREE PRODUCT CONTAMINATION AT THE HAMPTON 4M SITE?

A. Yes I do.

Q. DO YOU AGREE WITH HER OPINIONS CONCERNING THE PRESENCE OF A CONTINUING SOURCE OR SOURCES AT THE HAMPTON 4M SITE?

A. Again, I agree with PNM Witness Terauds on this point.

Q. HAVE THE OPINIONS THAT YOU HAVE STATED IN YOUR TESTIMONY BEEN BASED UPON A REASONABLE SCIENTIFIC CERTAINTY?

A. Yes they have.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION COMMISSION

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION COMMISSION FOR THE PURPOSE OF CONSIDERING:

APPLICATION OF PUBLIC SERVICE COMPANY OF NEW MEXICO FOR *DE NOVO* HEARING ON ORDER NO. R-11134 ISSUED BY THE NEW MEXICO OIL CONSERVATION DIVISION IN

CASE NO. 12,033

AFFIDAVIT

STATE OF NEW MEXICO)
)**SS.**
COUNTY OF BERNALILLO)

I, Toni K. Ristau, upon being first duly sworn according to law, under oath, depose and state: That I am Director of Environmental Services for Public Service Company of New Mexico, and that I have read the foregoing Direct Testimony, including exhibits. I further affirmatively state that I know the contents thereof and that they are true and correct to the best of my knowledge and belief.

SIGNED this 8th day of July, 1999.

TONI K. RISTAU

SUBSCRIBED AND SWORN to before me this 8th day of July, 1999.

(Seal, if any)

Notary Public

[My Commission Expires: Oct. 22, 1999]

DAM0257

BEFORE THE

NEW MEXICO ENERGY, MINERALS AND NATURAL RESOURCES

OIL CONSERVATION COMMISSION

**IN THE MATTER OF THE APPLICATION OF
PUBLIC SERVICE COMPANY OF NEW MEXICO
FOR REVIEW OF OIL CONSERVATION DIVISION
DIRECTIVE DATED MARCH 13, 1998
DIRECTING APPLICANT TO PERFORM
ADDITIONAL REMEDIATION FOR
HYDROCARBON CONTAMINATION,
SAN JUAN BASIN, NEW MEXICO CASE NO. 12033**

DIRECT TESTIMONY OF

MAUREEN GANNON

SUBMITTED ON BEHALF OF

PUBLIC SERVICE COMPANY OF NEW MEXICO

APPLICANT

JULY 9, 1999

OCC CASE NO. 12033
TESTIMONY OF
MAUREEN D. GANNON

Q. CAN YOU PLEASE STATE YOUR NAME AND YOUR PLACE OF EMPLOYMENT?

A. My name is Maureen D. Gannon and I am employed by Public Service Company of New Mexico ("PNM"), Alvarado Square, Albuquerque, New Mexico, in the Environmental Services Department. I am presenting this testimony on behalf of PNM.

Q. WHAT IS YOUR CURRENT POSITION WITH PNM AND WHAT ARE YOUR JOB DUTIES IN THAT POSITION?

A. My current position is project manager of PNM's Pit Remediation Project. As project manager, I control the resources (i.e., people, materials, equipment, contractors, and day-to-day budget) to complete the excavation and remediation of over 1,200 unlined surface impoundments in the San Juan Basin and the investigation and remediation of any associated contaminated groundwater locations. I am responsible for managing the day-to-day operations, preparing reports and documentation to the regulators, and serving as liaison between PNM and operators, producers and other stakeholders.

Q. HOW LONG HAVE YOU SERVED AS PROJECT MANAGER AT PNM?

A. I served as technical project manager from 1995 until January 1998. From January 1998 to present, I have assumed the role of overall project manager.

Q. CAN YOU PLEASE BRIEFLY SUMMARIZE YOUR TESTIMONY?

A. Yes. My testimony provides a summary chronology of the investigation and remediation efforts taken with respect to contamination at the Hampton 4M well site. I also address how the data developed through this investigation demonstrates that the free product contamination at this site must have originated from some source or sources upgradient of PNM's former unlined dehydrator pit. My testimony also discusses how the free product situation at the Hampton 4M site is unprecedented in PNM's experience with similar sites. I discuss the fact that Burlington's remediation efforts at the site have guaranteed that PNM's former pit cannot possibly be the source for any continuing contamination at this site. Finally, I sponsor a number of exhibits documenting the investigation and remediation efforts at the Hampton 4M site.

Q. PLEASE STATE YOUR EDUCATIONAL AND PROFESSIONAL EXPERIENCE.

A. I have a Bachelor's of Science degree in Chemical Engineering granted in 1983 from New Mexico State University. I have a Masters degree in Business Administration/Technology Management from the University of Phoenix. From 1983 to 1987, I was employed as a process engineer at Rocky Flats in Golden, Colorado. In 1987, I moved to Albuquerque and worked for Geoscience

Consultants, Ltd., an environmental consulting firm, as an environmental engineer until 1997 when I became an employee of PNM.

Q. WHAT TYPES OF ENVIRONMENTALLY-RELATED PROJECTS HAVE YOU WORKED ON?

A. In addition to the Gas Assets Pit Remediation Project, I served as technical project manager of a remediation system for cleanup of contaminated soil and groundwater at a natural gas processing plant in southern New Mexico. I was also the project manager of a storm water, sewer, air and hazardous waste compliance and sampling program at a major aircraft manufacturing facility. I served as task leader for a comprehensive Best Management Practice(s)/Best Available Treatment (BMP/BAT) study to identify potential chemical oxygen demand (COD) sources and management technologies for minimizing COD in storm water runoff. I did an extensive amount of permitting and compliance work related to SPCC plans, waste discharge plans and compressor air permits at various facilities throughout New Mexico and the United States. In addition, I have performed numerous environmental due diligence facility audits as well as Phase I environmental audits.

R. WHAT ARE YOUR RESPONSIBILITIES WITH PNM RELATED TO SITES HAVING CONTAMINATED GROUNDWATER?

A. Since 1995, I have served as the technical project manager of 37 groundwater sites discovered in conjunction with the Gas Assets Pit Remediation Program. My duties include overseeing the investigative and remediation phases at each of these groundwater sites. I manage the groundwater scientists, technicians, and subcontractors in their efforts, including well installations, groundwater sampling, secondary remediation related to soil excavation or installation and monitoring of advanced remediation systems. I also prepare and/or review all documentation associated with these groundwater sites. Prior to the Pit Remediation Project, I managed other contaminated groundwater sites at various facilities including gas plants and UST sites and performed similar duties.

Q. WHAT ARE YOUR RESPONSIBILITIES WITH RESPECT TO THE HAMPTON 4M WELL SITE?

A. I serve as the project manager for all activity related to pit and groundwater clean-up at the site. To date, I have supervised the site assessment and excavation activities, drilling to define vertical extent of contamination, installation of groundwater monitoring wells, installation of the free-product recovery system, and ongoing monitoring activities.

Q. IS THE HAMPTON 4M BEING HANDLED PURSUANT TO PNM'S PIT REMEDIATION PROGRAM?

A. Yes. The site is being handled pursuant to PNM's Unlined Surface Impoundment Closure Plan and the Groundwater Management Program Unlined Surface Impoundment Closure Plan. These plans were written in accordance with OCC Order R-7940-C relating to the elimination of discharges into unlined pits ("OCC Order"). The Unlined Surface Impoundment Closure Plan was submitted to and approved by the OCD in 1993. The Groundwater Management Program Plan was submitted to and approved by the OCD in 1996. The OCC Order calls for the cessation of discharge into unlined surface impoundments ("pits") within environmentally-sensitive areas near rivers, major tributaries and washes within the San Juan Basin. To cease discharge means to stop the discharge of produced waters from the separator and dehydration units associated with gas wellhead production into on-site unlined surface impoundments or "pits."

Q. WITHIN THE AREAS UNDER OCD JURISDICTION, IS THERE ANY TYPE OF RELATIVE PRIORITY GIVEN TO PARTICULAR SITES?

A. For sites that fall under the OCC Order, the Order established a three-tiered approach, with different deadlines for cessation of discharge depending upon whether the site fell into the original, expanded, or extended vulnerable areas. The OCC Order explicitly addresses cessation of discharge to unlined surface

impoundments only; there is no deadline established in the Order for the cleanup and closure of pits. The guidance provided by OCD for compliance with the Order establishes that operators should submit closure or remediation plans to the OCD by a certain date, but does not establish a deadline for closure that is tied in any way to the deadline for cessation of discharge. The only deadline for closure is that all pits must be closed within 45 days after production ceases and the well is plugged and abandoned. Thus, the closure deadline is tied to cessation of production, not cessation of discharge.

Q. IF CLEANUP OF A PIT WITHIN A VULNERABLE AREA IS UNDERTAKEN, ARE THERE ANY GUIDELINES FOR DETERMINING WHETHER CONTAMINATION LEVELS TRIGGER A NEED FOR REMEDIATION OR FOR WHEN REMEDIATION IS COMPLETE?

A. The contamination assessment and cleanup guidelines for soils differ, depending on the ranking of the site with respect to depth to groundwater, distance to protected wellheads and distance to surface water.

Q. DO THE SAME GUIDELINES APPLY TO GROUNDWATER SITES?

A. No. A groundwater site is considered contaminated when certain hydrocarbon constituent concentrations in the impacted groundwater exceed the WQCC standards (for benzene, the most common/sensitive contaminant of concern at these sites, the standard is 10 ppb). Groundwater remediation is considered to be

complete, and the site can be closed, once the concentrations of benzene (and potentially, other constituents) are reduced below the WQCC standard.

Q. IN WHICH DESIGNATED VULNERABLE AREA IS THE HAMPTON 4M?

A. The OCD takes the position that once you discover groundwater, you are within a vulnerable area whether or not the site appears to be within a designated vulnerable area on the map.

In the case of the Hampton 4M, based upon the map designation, it was borderline whether the site fell within a designated vulnerable area at all. If the site was within a vulnerable area, it would be the extended vulnerable area.

Q. WHAT ARE THE DIFFERENCES IN REQUIREMENTS FOR CESSATION OF DISCHARGE VERSUS PIT CLOSURE UNDER THE OCC ORDER?

A. Strictly speaking, the OCC Order only requires cessation of discharge, but does not require that any pits that received the discharge be remediated or closed within any specified period of time following cessation of discharge. But, as a practical matter, until you cease discharging to a pit, you cannot effectively remediate it or close it, because you may remediate and then immediately recontaminate the pit if discharges continue.

At the sites where PNM has undertaken remediation, depending on the vulnerable area time-frame trigger, cessation of discharge was often accomplished some period of time before the actual remediation. Sometimes cease-discharge occurred just shortly before actual remediation was initiated. This was the case at the Hampton 4M.

Q. PLEASE DISCUSS THE INITIAL ACTIONS UNDERTAKEN BY PNM AT THE HAMPTON 4M TO COMPLY WITH OCD'S DISCHARGE ORDER .

A. A chronology of PNM activities at the site appears as PNM Exhibit 13. This exhibit was prepared under my direction and provides an accurate summarized chronological description of the investigation and remediation activities to date at the site. It is based upon site visits, field activities and reports that have flowed between PNM, Burlington and the OCD. The data used to compile PNM Exhibit 13 as well as the other exhibits prepared by PNM were based upon data collected and analyzed by PNM.

PNM conducted a routine site assessment at the Hampton 4M well on April 23, 1996. The site assessment form is included as PNM Exhibit 14. The assessment was performed to determine the need for cease discharge and whether or not pit remediation was required at the site. During the assessment, a visual observation of the site was made. Field personnel provided pit dimensions of 20'L X 20'W X 3' D. Well pad dimensions were noted as 250' X 150'. It is important to note

that the total surface area of PNM's pit was approximately 1% of the entire well pad surface area. PNM also made detailed notes of general site and surrounding vicinity features including distances to water courses, type and location of equipment and pits, and conditions within the pit. A physical assessment of the pit is normally conducted using a hand auger. However, in the case of the Hampton 4M, PNM found that the pit depression had standing liquid in it and emanated a hydrocarbon odor. Therefore, we did not collect a sample for field or laboratory analysis since we knew that the pit was sufficiently contaminated to require remediation. This is also documented in PNM Exhibit 14.

Q. ARE THESE INITIAL OBSERVATIONS THAT WERE RECORDED FOR THE HAMPTON 4M SITE FAIRLY TYPICAL OF WHAT PNM SEES AT OTHER UNLINED SURFACE IMPOUNDMENTS?

A. Yes. PNM has remediated over 1,200 pits and we often see free-standing liquid in the pit depression prior to remediation. However, the presence of fluids or stained soil does not usually mean that there is free product contamination of groundwater beneath the site.

Q. HOW WAS CEASE DISCHARGE ACCOMPLISHED AT THE SITE?

A. Williams shut the flow off on the dehydrator units prior to PNM conducting excavation. That, in essence, constituted cease discharge. Our on site field technician indicates that the dehydrator was re-activated during the week after excavation. A 45 bbl above ground, below-grade tank was placed next to the

dehydrator and a dehydrator discharge line was piped into the new tank prior to re-activation.

Q. ONCE THE TANK WAS PLACED AT THE SITE, WERE THERE ANY OTHER DISCHARGES ONTO THE SOIL FROM THE DEHYDRATORS?

A. No. The purpose of the tank is to catch the discharge from the dehydrators. When cease discharge is achieved, there are no further releases of hydrocarbon-contaminated fluids to ground surface and any source of hydrocarbon contamination to soil.

Q. WHAT WAS THE PROCESS USED TO CONDUCT PIT REMEDIATION AT THE HAMPTON 4M AND TO WHAT EXTENT WAS THE PIT CLEANED UP?

A. Once we conducted our site assessment and determined that the pit soils required remediation, we returned to the site the following day, April 24, 1996, to begin our excavation. PNM's contractor used a trackhoe to excavate the pit. During pit excavation, the contaminated soil was removed to a width and depth determined by the PNM Field Coordinator. Field notes indicate that approximately 300 cubic yards of soil was removed from the pit and landfarmed on location. The field notes indicate that our technicians were able to dig to approximately 11.5 to 12 feet across the bottom of the excavation. However, several factors prevented us from further excavation. There was a 15-foot drop off on the northwest end of the well pad and the existence of equipment on the south end of the excavation. This

created difficulty in maneuvering heavy earth-moving equipment around the excavation. In addition, the side walls of the excavation were very unstable and three cave-ins of soil occurred during digging. All of these factors prompted our on-site field technician to cease excavation at 12 feet in depth.

Q. HOW DOES PNM CONDUCT SCREENING OF FIELD TESTING TO DETERMINE IS A PIT HAS BEEN REMEDIATED?

A. PNM uses a photoionization detector (PID) to conduct a profile of the sidewalls and bottom of the excavation as digging occurs. The PID we use is a portable field-screening device that measures the concentration of organic vapors emitted from soil. This device uses ultraviolet light to ionize compounds. When compounds are present that have a lower ionization potential than that of the irradiation energy (10.2 electron volts with standard lamp), they are ionized. The ions formed are collected in an electrical field, producing an ion current that is proportional to the compound concentration. The constituent of concern we are looking for is primarily benzene. Our PID's are calibrated using a benzene response factor so that the concentration the PID records gives us a relative indication of benzene contamination in soil. Field PIDs are not scientifically accurate and really only serve as a means for field screening to help in determining when to cease excavation and/or collect a laboratory sample. In our experience, the PID predominantly overstates actual laboratory-measured BTEX concentrations.

Q. HOW CLEAN WAS THE PIT WHEN YOU COMPLETED EXCAVATION?

A. As documented in our field notes, the south, west and east walls at 10 to 12 feet were below 100 ppm on the PID. In fact, according to OCD/BLM guidelines, the walls were under the guideline standard for BTEX in soil and were considered clean. At the Hampton 4M, the field notes indicate that the north wall (on the edge of the well pad towards the wash) still registered approximately 800 ppm at 12 feet. In the bottom of the pit, PNM documented PID readings of between 900 and 1200 ppm. As noted previously, we often see high PID readings and laboratory analysis later shows BTEX to be at lower concentrations. On April 25, 1996, we collected a laboratory sample from the pit bottom; analysis provided a benzene concentration of 16 ppb (slightly above the OCD guideline of 10 ppb); benzene, toluene, ethylbenzene and xylenes (BTEX) concentration of 622 ppb (above OCD guideline of 50 ppb); and total petroleum hydrocarbons (TPH) concentration of 1301 ppm (above OCD guideline of 100 ppm). Based upon these results, we recognized that the pit excavation bottom was still contaminated. It is important to note, though, that the field technician did not denote saturated soil conditions in the pit bottom.

ppm rather than ppb for both BTEX OCD guideline as per testimony 8/26/99

Q. WHICH ONE OF THE EXCAVATION WALLS WERE PNM FORMER DEHYDRATORS POSITIONED ABOVE?

A. The dehydrators were positioned directly over the south wall of the excavation. The field notes indicate that at 12 feet, near the bottom of the excavation, the PID reading was 50 ppm.

Q. WHAT IS THE SIGNIFICANCE OF "CONTAMINATED" VERSUS "SATURATED" WITH REGARD TO SOILS?

A. Saturated soil is often dark gray to black in color and emits an extremely strong hydrocarbon odor. The soil is wet and oily to the touch. As the soil was not saturated in the bottom of the pit excavation at the Hampton 4M, we found no indication that free product had entered our former pit and had traveled to groundwater through the pit.

Q. WITH REGARD TO THE WORK THAT WAS DONE AT THIS SITE, HOW WOULD YOU CHARACTERIZE THE EXTENT OF THE REMOVAL OF THE CONTAMINATED SOIL?

A. PNM removed approximately 300 cubic yards of contaminated soil; based upon the number of pits we have remediated in the past four years (over 1,200 pits), this is an average amount for sites with soil contamination due to dehydrator discharges only. At the time of excavation, this site seemed fairly straight forward. Our goal during pit remediation is to remove grossly contaminated soil and define the vertical extent of contamination. Often, we do leave "hot"

sidewalls (above OCD guidelines) and still receive closure from the OCD on pits as long as the vertical extent of contamination is properly addressed and the gross contamination removed.

Q. DID THIS PARTICULAR WELLPAD CONFIGURATION AFFECT PNM'S ACTIVITIES AT THE HAMPTON 4M SITE?

A. Yes. As previously noted, because of the constraints imposed by the limited amount of space and the steep slope, PNM was unable to excavate sufficient material to "clean close" the pit. Thus, under direction by OCD, PNM returned to perform vertical profiling after the pit was excavated and backfilled with clean fill material.

Q. WHAT IS "VERTICAL PROFILING?"

A. At the direction of the OCD, PNM has been performing vertical profiling whenever a situation exists where PNM has been unable to excavate or remove sufficient source (contaminated) soils to reach BTEX and TPH concentrations below OCD guidelines in the bottom of the pit excavation. The vertical extent profiling is conducted to ensure that any contaminated soils left in place do not pose a threat to underlying groundwater. Vertical profiling is accomplished by using a drill rig to auger down to determine the vertical depth of how far contamination has traveled. Profiling is completed when the drill rig encounters one of the following in the borehole: (1) clean soil; (2) groundwater; or (3)

impervious sandstone or bedrock. In all instances, vertical profiling provides the status of the soil column beneath the pit and above the bottom of the borehole at termination. The data collected aids in determining whether the residual contamination has contributed to groundwater contamination.

Q. WHAT IS THE DIFFERENCE BETWEEN "FREE PRODUCT" AND "DISSOLVED PHASE HYDROCARBONS"?

A. Liquid hydrocarbons, such as those produced in large quantities by Burlington at the Hampton 4M site, do not naturally mix well with water, including groundwater. The "free product" or "free phase" is largely liquid hydrocarbon, with trace amounts of water and other substances, and as its specific gravity is less than that of water, it tends to float on the surface of water, including the water table. It is detectable as a distinct layer. It moves with the groundwater, following generally the same flow paths as the groundwater itself, but it is distinguishable by visual inspection, by phase-detecting meters, and by laboratory analysis as being a separate and distinct layer with its own physical and chemical characteristics. "Dissolved phase" hydrocarbons are, by contrast, small concentrations of hydrocarbons that are miscible and moving with the groundwater. In the case of dissolved phase hydrocarbons, the mixture is mostly water, with trace amounts of hydrocarbons; with free phase, the mixture is mostly liquid hydrocarbon, with

trace amounts of water. In technical terms, the free-phase hydrocarbon such as is present at the Hampton 4M site is a light non-aqueous phase liquid, or LNAPL.

Q. WHAT ARE THE IMPLICATIONS FOR REMEDIATION OF A SITE IF FREE-PHASE HYDROCARBONS, OR LNAPL, ARE PRESENT?

A. Given the physical-chemical characteristics of the liquid hydrocarbons, if they are present as a free phase on the groundwater, there will always be dissolved phase hydrocarbon constituent contamination that is above WQCC and drinking water standards.

The goal of remediation of groundwater at a site such as the Hampton 4M is to meet the WQCC or drinking water standards for particular dissolved phase contaminants that are part of the hydrocarbon plume. The goal is unattainable unless and until you can determine how and where the liquid hydrocarbons are being or have been released to the environment. Once that determination is made, the most effective remediation technique is to stop the release, remove as much free phase hydrocarbon as possible to eliminate the secondary source of dissolved phase contamination of groundwater, and to allow the dissolved phase contamination to attenuate naturally until concentrations are below applicable standards.

Q. ONCE THE EXCAVATION WAS COMPLETED AT THE HAMPTON 4M SITE, WHAT HAPPENED WITH REGARD TO PNM'S FORMER PIT?

A. The pit was backfilled with clean soil the same day the excavation occurred. PNM had determined that since a "clean" pit bottom was not achieved at the site, we would be required by OCD to return at some future date and conduct vertical extent drilling to ascertain the vertical depth to which contamination was present. In cases of vertical extent delineation, the OCD will approve a pit closure if a clean bottom hole sample is retrieved in the boring or bedrock is encountered. If groundwater is reached, a water sample is collected for analysis of BTEX. If the water is contaminated, the OCD is notified and the site becomes an OCD-listed groundwater site.

Q. PLEASE EXPLAIN THE PIT REMEDIATION AND CLOSURE REPORT ATTACHED AS PART OF PNM EXHIBIT 14.

A. Upon completion of our assessment and/or excavation and source removal work, PNM fills out a "draft" Pit Remediation and Closure Report. This form is a working document and assists us with record keeping. When all work is completed at the site, a final version of the report is prepared with signature and submitted to the OCD for closure approval.

Q. WHEN DID PNM RETURN TO THE SITE TO PERFORM VERTICAL EXTENT DRILLING AND WHAT WAS THE RESULT OF THAT ACTIVITY?

A. PNM returned in December of 1996 to perform vertical extent drilling. PNM Exhibit 15 includes a copy of the field boring log for MW-2, along with all other boring logs relating to the Hampton 4M investigation. The drilling crew bored to approximately 27.8 feet and encountered water. Between 0 and 10 feet, light brown silty sand was encountered with no detectable hydrocarbon odor. This was consistent with the clean backfill placed in the pit excavation by PNM during soils remediation. At 10 feet, the on site geologist noted a strong hydrocarbon odor (similar soil characteristics) and, at 12 feet, a dark brown streak of silt to clayey sand was observed. At 16 feet, another streak of dark brown silty sand was noted and a strong hydrocarbon odor was detected. At 21 and 22 feet, the soil began to change to a light gray to greenish gray silty to clayey sand. The soil was wet but hard to the touch and a strong hydrocarbon odor emanated from the cuttings. The geologist noted in the boring that the soil could be saturated with product. At 27.8 feet, groundwater was first encountered. The crew then proceeded to bail water from the hole. When the bailer became visible, the geologist noted in the bailer the presence of approximately 2 inches of free phase product on the water surface. In other words, there was free-phase, non-aqueous "oil" floating on top of the water in the bailer. PNM's field technician collected a sample for laboratory analysis of BTEX. We then installed a groundwater monitoring well in the borehole using 2-inch PVC pipe. This well was labeled MW-2.

Q. PLEASE EXPLAIN THE SIGNIFICANCE OF ENCOUNTERING "SOIL...SATURATED WITH PRODUCT" AT 21 AND 22 FEET.

A. Saturated soil conditions at this depth are consistent with the discovery of "first water" in the borehole at 27.8 feet and free phase product on the water surface. During drilling, the boring becomes smeared at the auger moves down the hole and the water table is artificially depressed. In the case of the Hampton 4M site, the water eventually sought a steady-state level at approximately 22 feet below ground surface. Fluctuations in water levels are normal in aquifers. The groundwater's natural fluctuations move overlying free phase product contamination up and down through the capillary fringe above the water table. Therefore, it was not surprising to see that the saturated conditions were noted at the 21 to 22 foot interval in the original borehole during vertical extent drilling. The presence of free product saturation in the capillary fringe and the lack of saturated conditions from the pit excavation bottom down to the water table is consistent with the findings that free product did not travel through our pit down to the water table.

Q. PLEASE REFER TO PNM EXHIBIT 4 AND IDENTIFY WHERE MW-2 WAS INSTALLED.

A. As mentioned previously, this is the very first well PNM installed and was the result of the vertical extent drilling. MW-2 was installed in the center of PNM's former pit. At all contaminated groundwater sites, we attempt to select what we

believe is the worst location in terms of contamination in the pit. Often, that location is the center of the former pit. Contaminated fluids tend to follow a bell shape from the pit bottom downwards and out. The center of the pit typically contains the highest contaminant concentrations.

Q. PLEASE REFER TO PNM EXHIBIT 7. CAN YOU TELL US WHAT THIS IS?

A. This is the letter I wrote to Mr. Bill Olson at OCD on January 13, 1997, indicating that we had sampled groundwater 28 feet below surface at the Hampton 4M in the area of our former pit and had discovered hydrocarbon contamination in the form of dissolved-phase BTEX. We are required by law to submit such notification. This letter served as official notification to the OCD that the groundwater at the Hampton 4M was contaminated. A copy of the letter was also provided to Burlington.

Q. WHAT WAS PNM'S NEXT STEP AT THE SITE?

A. On January 31, 1997, we returned to the site to install additional monitoring wells. The monitoring well network serves to delineate and monitor the contaminant plume and also assists us in determining the gradient and direction of groundwater flow. At least three of the monitoring wells are placed in triangulation so that we have varying elevations and physical coordinates to establish groundwater contours across the site.

In January, PNM installed groundwater monitoring wells MW-3 and MW-4. MW-3 was located along the western edge of the well pad and upgradient from PNM's former operations. MW-4 was located in the northern half of the well pad and upgradient of PNM's former operations in the vicinity of Burlington's activities. Groundwater samples taken from these wells indicated that BTEX was not present in MW-3 and was 800 ppb in MW-4. At that time, we saw no evidence of a hydrocarbon sheen or free phase floating product on the water surface in MW-4. Based upon these two additional wells at the site, we were able to preliminarily determine groundwater flow to be northwesterly in direction beneath the site. This is depicted on PNM Exhibit 8 by a large blue arrow.

Q. AFTER THE TWO ADDITIONAL WELLS WERE INSTALLED, WHAT DID PNM DO NEXT?

A. With the initial sampling of MW-4, we discovered groundwater contamination upgradient of PNM's former pit. Because Burlington's operations are upgradient of the location of PNM's former activities at the site, we called Burlington in February of 1997 and informed them that the groundwater problem at the site was more widespread than originally thought.

Q. AT THIS POINT IN TIME, HAD BURLINGTON CONDUCTED ANY INVESTIGATION OR REMEDIAL ACTIVITY AT THE SITE?

A. PNM was not aware of anything that Burlington might have done related to investigation or remediation. When we informed Burlington of the upgradient

contamination, they did not indicate that they had undertaken pit remediation or other similar work at the site at any time.

Q. WHAT HAPPENED AFTER YOUR NOTIFICATION OF BURLINGTON?

A. PNM wished to conduct more investigation. Burlington was uncertain, at that time, what really needed to be done. While there was cooperative discussion between the parties, nothing was actually resolved.

Q. WHAT WAS THE NEXT ACTIVITY AT THE SITE?

A. PNM and Burlington met in April 1997 to discuss strategies at the site. We talked about installing additional monitoring wells and conducting further excavation. On April 14, 1997, Burlington notified PNM that they had discovered a hydrocarbon seep to the north of the well pad that was just at the top of an arroyo that traveled northerly from the site. This seep and the arroyo are identified in PNM Exhibit 8. PNM's observations of the seep were that the discharge was water and oil with a strong hydrocarbon odor, and the soil was visibly stained.

Q. WHAT EXACTLY IS THE "HYDROCARBON SEEP" AT THIS SITE?

A. The hydrocarbon seep is an area where free product mixed with water has surfaced at the toe of embankment off the northwest edge of the well pad. The origin of the fluids is somewhere upgradient of this location.

Q. IS THE HYDROCARBON SEEP DIRECTLY DOWNGRADIENT OF THE LOCATION OF PNM'S FORMER PIT, AND IS IT ATTRIBUTABLE TO PNM'S FORMER OPERATIONS?

A. The seep is downgradient from the area where the thickest layer of free product was initially found at the site, and from the area where PNM's free product recovery well (MW-6) was located. It is directly downgradient from Burlington's operations at the site. Now that Burlington has completely excavated the entire area where PNM's former pit and equipment were located, the ongoing appearance of free product at the seep cannot possibly be attributed to PNM's former operations.

Q. ARE YOU AWARE OF THE CURRENT STATUS OF THE SEEP?

A. Yes. When we visited the site on March 1, 1999 after Burlington had completely excavated the area in the vicinity of PNM's former operations and had partially backfilled that area with clean fill, we looked at the hydrocarbon seep and took photographs of it. These photographs are PNM Exhibits 16 and 17. The free phase hydrocarbons are visible as a sheen or "rainbow" on the water. This fluid had collected in the seep, which is in a small depression within the wash below the well pad. In addition, Mr. William Olson of the OCD also visited the site on April 14, 1999. Groundwater results indicated a benzene concentration of 40 ppb. Mr. Olson provided copies of the analytical results which are found in PNM Exhibit 18.

Q. WHAT DO THE ANALYTICAL RESULTS SHOW, AND WHAT IS THE SIGNIFICANCE OF THESE RESULTS?

A. The analytical results show that benzene at 40 ppb is above the WQCC groundwater standard of 10 ppb. As benzene is quite volatile, it vaporizes off water very quickly if the water is exposed to the open air. Unless there has been a recent release to the water, we would expect the benzene concentration in the seep to be well below the standards. Therefore, the presence of benzene in the dissolved phase at concentrations approximately four times the WQCC groundwater standard, and eight times the drinking water standard, are indicative of a recent or continuing release of liquid hydrocarbons to the water.

Q. WHAT HAPPENED AFTER THE INITIAL DISCOVERY OF THE HYDROCARBON SEEP BACK IN APRIL 1997?

A. After the initial discovery of the hydrocarbon seep, Burlington notified both OCD and PNM. We then held a meeting at the site with all parties (Burlington, OCD and PNM) and at that time, the OCD requested that immediate action be taken with regards to the seep area. On April 17, 1997, Burlington responded to this request by conducting excavations around the northwestern perimeter of the well pad and opening up a trench in this area to collect the seep discharges. Burlington then commenced with excavation in the location of their 300-barrel fluids tank using a backhoe. They were unsuccessful in penetrating the sandstone layers that exist at varying depths in the southeastern portion of the well pad.

After Burlington's excavation attempt, PNM and Burlington met on June 4, 1997 and decided that a drill rig would probably be more successful in boring through the sandstone in order to identify the sources of contamination on the site. Burlington conducted borings on June 5 and 6, 1997. The borings were installed as TPW-1 through –7 as depicted in PNM Exhibit 6.

Q. WHAT WERE THE RESULTS OF THE BORINGS?

A. The borings were left in place for only four to five days. Groundwater was encountered in TPW-1, -2, -5, -6 and –7. There was some dissolved phase in TPW-1 and TPW-5. There was measurable free phase floating product in TPW-2. TPW-6 and -7 had very high concentrations of BTEX in the 30,000 ppb range. All of these borings were located upgradient of PNM's former pit and operations and were at or down gradient of Burlington's operations.

Q. ARE THERE ANY ISSUES THAT ARE ASSOCIATED WITH THE LENGTH OF TIME THE BORINGS WERE LEFT IN PLACE?

A. Yes. In our experience at almost 40 groundwater sites in the San Juan Basin, it may take several days, even weeks, for equilibrium to be re-established in the subsurface. These borings were not left in place long enough to obtain a true representation of steady-state conditions in these borings.

Q. WHAT WAS THE NEXT ACTIVITY WITH REGARD TO THIS SITE?

A. On August 25th, PNM was informed of a landowner's well located to the northeast of the well site. The well was not in use but there was concern that

contamination from the site might have impacted the well. Therefore, PNM collected a groundwater sample for analysis for BTEX from the well after purging the well of the necessary volume of water and ensuring the required parameters were stabilized. The results of the sampling indicated the well was clean and contamination had not reached this well.

Q. WHAT WAS THE NEXT ACTIVITY CONDUCTED AT THE SITE?

A. On October 29th, PNM installed additional groundwater monitoring wells. PNM Exhibit 8 provides a view of the new wells, MW-1 and MW-5. MW-1 is the furthest upgradient well and provides "background" water quality information for the entire well pad. MW-5 is located in the wash, immediately downgradient or to the northwest from the site.

MW-1 showed BTEX concentrations to be below WQCC standards and confirmed that there was no additional source upgradient of the well pad that might be contributing to contamination. MW-5 showed some dissolved-phase hydrocarbons in the 6000 ppb range for benzene. This, of course, indicated that contamination had moved off site.

Q. WHAT WAS THE PURPOSE OF INSTALLING MW-5?

A. PNM was following its groundwater management plan. When we construct a monitoring network at a groundwater site, we first establish a source well. Then, we move upgradient to put in a background well and then downgradient of the

source to install additional wells for the purpose of groundwater contouring, determination of the downgradient extent of contamination, and monitoring.

Since MW-5 was contaminated, PNM performed additional soil borings to the north of the well pad and downgradient of MW-5 on November 11, 1997. Again, we were attempting to define the leading edge of the contaminant plume. From MW-5, we moved down the wash in the northwest direction several feet and installed one temporary well, TMP-1. PVC pipe was dropped into the well with screening across the water table. A groundwater sample indicated that there was dissolved phase contamination above WQCC standards. We conducted several more borings the length of the wash until we reached a Williams pipeline approximately 1000 feet from the well pad that traversed the wash perpendicularly. We chose not to cross the pipeline because of concern in possibly encountering additional hydrocarbon sources.

Q. PLEASE DESCRIBE WHAT HAPPENED NEXT AT THE SITE.

A. On November 12, 1997, PNM installed MW-6, a 4-inch monitoring well for the purpose of recovering free product in the vicinity of PNM's former pit. Refer to PNM Exhibit 8 for MW-6's location. The well was situated about 10 to 15 feet to the west of MW-2. PNM gauged 4.8 feet of free product in the well.

Q. WHY DID PNM UNDERTAKE THIS ACTION?

A. The OCD put PNM on notice requesting that we address the contamination in the area of our former pit. This letter is dated August 27, 1997 and is provided as PNM Exhibit 19.

Q. WHAT WAS THE NEXT ACTIVITY AT THE SITE?

A. PNM returned to the site in December of 1997 and installed MW-7. At that time, MW-7 was the furthest downgradient well located just a few feet south of Williams' pipeline and approximately 900 feet in the northwest direction from the well pad. As I indicated previously, we had traveled down the wash conducting soil borings and had not found a clean borehole. We decided to install a well at this location because our concern was that if we stepped over the pipeline, we could, in fact, possibly encounter another contaminant source. This might further confuse the issue of adequate characterization of the contamination at the Hampton 4M. Therefore, we stopped at the pipeline and installed a well. At the same time, we also installed MW-8 located along the eastern perimeter of the location. Both wells showed dissolved phase BTEX contamination above WQCC standards.

Q. WHAT OTHER ACTIVITIES WERE TAKEN BY PNM WITH RESPECT TO THE SITE?

A. On January 12, 1998, PNM commenced product recovery out of MW-6. MW-6 is a four-inch product-recovery well with the product-recovery pump installed. The pump is a nitrogen-displacement pump. The product is extracted through a

hydrophobic filter that only allows product (oil) to flow in, no water. It operated cyclically and pumped approximately three times per day. Once sufficient drawdown had occurred, the pump would shut off until recharge took place. It would then cycle and begin pumping again. 8/26/99

The discharge was emptied into a 55-gallon drum located next to the above-ground condensate tank now owned by Williams. When the drum was full, its contents were pumped into the condensate tank receiving discharge from the dehydrator. This tank is owned by Williams. Burlington periodically pumps out the condensate tank and transports the fluids off site for sale to an oil recycler.

Q. WHY DID PNM CEASE OPERATION OF THE PRODUCT RECOVERY PUMP IN EARLY NOVEMBER 1998?

A. In a phone conversation with Ed Hasely of Burlington, Mr. Hasely indicated that Burlington was commencing their site wide excavation. He stated that at some point Burlington would be removing PNM's monitoring wells and we would need to remove our product recovery system. After that phone conversation, we were informed a few days later that the pump had been removed by Williams without our knowledge or consent. PNM was no longer able to continue product recovery at that point.

Q. WHAT WAS THE NEXT ACTIVITY AT THE SITE AFTER THE FREE PRODUCT PUMP WAS STARTED IN JANUARY 1998?

A. PNM conducted normal quarterly monitoring in January of 1998. The results of the monitoring showed MW-2 and MW-6 to contain free product. Benzene levels in MW-4 had increased to 1200 ppm. This indicated that a fresh source of hydrocarbons upgradient of MW-4 was probably causing an increase in benzene concentrations in this well.

Q. WHAT EVENT FOLLOWED?

A. On April 14,1998, PNM again conducted quarterly groundwater sampling at the site. We measured 0.37 feet of free product in MW-8. This confirmed that there was a free-product source or release point upgradient of PNM's former pit in the area of MW-8. It was not surprising that free product found its way to MW-8 after several months. As I discussed previously, it often takes weeks for the subsurface to equilibrate after a boring or well is installed.

Q. WHAT WAS THE NEXT ACTIVITY ON SITE?

A. On May 11, 1998 Burlington installed wells MW-9, in the approximate location of the old TPW-1, and MW-10, which is in the approximate location of the old TPW-2. MW-9 had dissolved phase BTEX concentrations above WQCC standards and MW-10 had measurable free product. Within 24 hours, 1.5 feet of free product was measured in MW-10. Please refer to PNM Exhibit 20 for a photograph of MW-10. The photograph shows PNM field personnel extracting a bailer of fluids from MW-10. Straw-colored free product is visible in the top layer of the bailer with water in the lower layer.

Q. PLEASE DISCUSS THE NEXT EVENT AT THE SITE?

A. On July 1, 1998, PNM conducted quarterly sampling at the site. Sample results were consistent with what we had been seeing. Free product was still measurable in MW-2, MW-8 and MW-10. We did not measure product levels in MW-6 because of the pump but we were still removing product at a steady rate. We saw an increase in the benzene concentration in MW-4 which lead us to believe that there was some grossly contaminated, saturated soil that had not been remediated upgradient of that well. PNM also contracted with a surveyor to perform a land survey of all wells at the site.

During this time, PNM also collected soil samples just above the water table in the northeast corner of Burlington's initial excavation on the southeast part of the well pad. The excavation is located just south of MW-13 depicted in PNM Exhibit 5 and appears as a large dark circle on the exhibit. The dark part is the water in the bottom of the excavation. PNM collected a sample at the soil-water interface in the northeastern corner of the hole. Laboratory analysis indicated 36 ppm benzene and 2000 ppm total BTEX in the soil. These results are above closure guidelines for soil as recommended by the OCD. The benzene guideline standard is 10 ppm and the BTEX standard is 50 ppm. Burlington's 300-barrel fluids tanks were located in this vicinity as was their pit.

Q. WHAT OTHER TESTING OR INVESTIGATION TOOK PLACE OUT AT THIS SITE?

A. PNM returned to conduct quarterly sampling on October 5, 1998. For the first time, we detected measurable free phase floating product in MW-4. The depth was 0.63 feet. As discussed previously, MW-4 is located upgradient of PNM's former operations. PNM's discovery of free product confirmed earlier observations that the increase in dissolved phase benzene concentration that occurred on January of 1998 was a forerunner indication of the appearance of free product. This confirmed that a source area or release point of contamination continued to persist in the south to southeastern edge of the well pad.

Q. WHEN WAS THE NEXT WORK THAT WAS DONE?

A. PNM was on site to review the installation of Burlington's SB-1 and SB-2. This took place on October 8, 1998. Free phase product was detected in SB-2 located in the area of our former pit. Dissolved phase BTEX was discovered in SB-1 located just north of Burlington's excavation.

Q. WHAT OTHER WORK HAS BEEN PERFORMED AT THE HAMPTON 4M SITE SINCE THAT TIME?

A. Burlington conducted an excavation in the area of PNM's former pit and additional investigations in areas upgradient of PNM's pit. This occurred between November 1998 and February 1999. From personal observations, Burlington's recent excavation work has included the excavation and removal of several

thousand cubic yards of soil with a bulldozer and trackhoe on the north end of the well pad. The soil excavated by Burlington was a mixture of both clean and contaminated soil so the precise volumes of contaminated soil could not be measured. In the area of PNM's former dehydration pit, Burlington excavated to 14 feet with a bulldozer. Clean fill was encountered throughout. Beyond that there was soil contamination in the range of 800 to 1500 ppm. These are not saturated soil conditions and corroborate previous borings (i.e. SB-2 in PNM Exhibit 15) that indicate that soil underneath our former pit to the groundwater surface was not saturated with free product. From 14 to 23 feet to when groundwater was discovered, Burlington encountered sandstone layering. During their remediation efforts, it appears that Burlington also conducted investigations and excavations upgradient of PNM's operations but at a much lesser intensity than in the area of PNM's former pit. The results of these investigations are largely unknown because of Burlington's limited sampling in this area and minimal documentation with regards to field notes and reports. Burlington's old excavation located in the southeastern end of the well pad was eventually backfilled. Burlington also backfilled much of the excavation in the vicinity of PNM's former operations.

Q. HAS PNM DONE OTHER WORK AT THE SITE SINCE BURLINGTON'S MASS EXCAVATION AND REMOVAL OF PNM'S RECOVERY AND MONITORING WELLS?

A. On May 5, 1999, PNM installed MW-12 in the center of PNM's former pit location. Benzene in groundwater was detected at 800 ppb. The well was sampled immediately following construction and groundwater results may not be indicative of the true groundwater conditions. PNM returned to the site and resampled the well on May 26, 1999. Laboratory results provided a benzene concentration of 1900 ppb. On May 19,1999, Burlington installed a new well, MW-13 near the former MW-4. Initial results indicated benzene was present at 1800 ppb.

During and subsequent to Burlington's remediation activities, PNM continued quarterly sampling at the site but was limited by the number of wells available for sampling. During their remediation activities, Burlington had removed six wells, MW-2, -3, -4, -8 and –10 (MW-2, -3, -4 and –8 were installed by PNM). PNM's quarterly sampling events occurred on January 27 and May 5, 1999. MW-1 was not sampled during either event because it had been clean for four calendar quarters. MW-5, -7 and -9 showed dissolved phase BTEX contamination above WQCC standards. MW-12 and MW-13 were also sampled and results were as indicated above. Another PNM quarterly sampling event is scheduled for July 1999.

Q. AND PNM EXHIBIT 21, CAN YOU TELL US WHAT THAT IS?

A. This is a letter dated April 8, 1997. that OCD wrote to Burlington – after the February 1997 visit between PNM, Burlington and NMOCD, instructing

Burlington to address contamination in the area of their tank-drain pit and production pit.

Q. PLEASE EXPLAIN THE PURPOSE OF PNM EXHIBIT 22.

A. This is a progress report of remediation activities at the site, dated March 31, 1998, from PNM to the OCD. PNM wrote this report in place of our annual groundwater report because this was a unique site, and so it was submitted under separate cover to the OCD rather than in our annual groundwater report.

Q. CAN YOU TELL US WHAT PNM EXHIBIT 23 IS?

A. This is a letter to Mr. Ed Hasely from the OCD dated April 7, 1998, but the greeting indicates "Dear Ms. Gannon". This letter was actually written to Burlington. The letter was issued subsequent to Burlington's excavation in the southeast corner of the well pad. It asks that two additional wells be installed in the location of their former temporary boreholes, TPW-1 and TPW-2, and that those wells be analyzed for BTEX and water-quality constituents. They were also to submit a report on their findings based on the new wells.

Q. HAD YOU HAD ANY DISCUSSIONS WITH OCD ABOUT THE SITUATION INVOLVING BURLINGTON'S STATUS OF THEIR WORK AT THE SITE VERSUS PNM'S?

A. Yes. I had talked extensively with Bill Olson of the OCD about the fact that we were very confused about what's going on with this site. We had determined that there were upgradient release points. We felt it was imperative to identify these

sources in order to properly address the site wide contamination and off site migration of contaminants.

Q. PLEASE REFER TO PNM EXHIBIT 24 AND IDENTIFY THIS LETTER.

A. This letter dated April 10, 1998 is PNM's response to the March 13th directive by OCD to remediate, conduct further remedial actions in the area and downgradient of our pit to address free-phase hydrocarbons.

PNM indicated to the OCD that we would be appealing that directive, but we would continue to operate our free-product recovery system and perform sampling.

Q. WHY WAS IT THAT DESPITE THE FACT THAT PNM WAS GOING TO APPEAL THE OCD'S DIRECTIVE, PNM STILL CONTINUED TO RECOVER THIS FREE-PHASE PRODUCT?

A. Again, PNM had been asked to address contamination under their former pit. With free-product recovery and monitoring, we were attempting to control the ongoing source of groundwater contamination and minimize the overall environmental impact, regardless of who may have caused the release of free product to the environment.

Q. AS SOMEONE WITH SUBSTANTIAL EXPERTISE IN THE FIELD OF ENVIRONMENTAL REMEDIATION, WAS THIS YOUR PREFERRED OR RECOMMENDED APPROACH AT THIS SITE?

A. No. My recommended approach would be to locate the upgradient release point or points for the free product, assure that the releases were not still occurring, and have the person or entity who actually released the material recapture it.

Q. BY JUST RECOVERING FREE PRODUCT IN THE VICINITY OF PNM'S OPERATIONS, WERE YOU ADDRESSING THE RELEASE POINT OR THE ULTIMATE SOURCE OF THE PROBLEM?

A. No. As PNM does not have any control over the operator or the operations that had released, and might be continuing to release free product, PNM could not completely remediate the groundwater contamination at the site. PNM could only contain the problem and slow its further migration downgradient and offsite.

Q. IN YOUR WORK ON THIS SITE, HAS PNM, IN YOUR OPINION, IN ANY WAY SOUGHT TO EVADE OR SHIRK ITS RESPONSIBILITIES WITH REGARD TO CLEANUP AT THIS SITE?

A. No. Our approach has been aggressive. We conducted pit remediation, an extensive soil and groundwater investigation, established a monitoring well network and commenced with free phase product removal. However, we determined that our remediation efforts would be futile until the unidentified sources upgradient of our activities were located, ceased and remediated. as per testimony 8/26/99

Q. ABOUT HOW MUCH HAS PNM SPENT TO DATE AT THIS SITE FOR REMEDIATION AND INVESTIGATION?

A. Over $200,000.

Q. THIS SITE HAS BEEN ACTIVE IN TERMS OF PIT AND GROUNDWATER REMEDIATION SINCE APRIL OF 1996. WHAT IS THE TYPICAL LENGTH OF TIME BETWEEN THE SITE ASSESSMENT AND CLOSURE OF A PIT?

A. At typical sites, once we have removed grossly contaminated soil and are managing dissolved phase contamination only in groundwater, it usually takes between 18 to 24 months to conduct quarterly sampling and demonstrate that through natural attenuation, groundwater contamination has been abated to below WQCC standards. The Hampton 4M well site is highly unusual because of the massive amounts of free product at the site. In our experience, discharges to dehydration pits do not result in free product on the water table. In those cases where we have free product, another source or release point has been identified upgradient of our operations.

Q. HOW MANY DEHYDRATOR PITS HAS PNM REMEDIATED TO DATE?

A. As of June 30, 1999, PNM has remediated approximately 1,200 pits on both the Jicarilla Reservation and within the OCD-designated vulnerable areas. Within the OCD areas, we completed the remediation of 773 pits. Of these pits, 296 received discharges from PNM dehydrators, 233 received discharges from PNM separators, and 176 pits were related to pipeline drips.

Q. PLEASE ELABORATE ON THE CONDITIONS THAT PNM TYPICALLY ENCOUNTERS AT SITES WITH DEHYDRATOR PITS.

A. Dehydrator pits typically have soil contamination only, and do not involve groundwater contamination. Of the 296 dehydrator pits PNM has remediated on in the OCD areas, we have detected potential or actual groundwater contamination at only 29 of the sites. That is, we have detected potential or actual groundwater contamination at about 10% percent of the total sites we have remediated due to the presence of contaminated soils.

Q. AT HOW MANY SITES WHERE PNM HAS HAD DEHYDRATORS OPERATING IN THE PAST HAS PNM ENCOUNTERED FREE PRODUCT?

A. We have not discovered free product on the groundwater table at any site where we have completed the source and groundwater investigation and determined that discharge from the dehydrator is the only potential source of contamination to groundwater. We have seven other dehydrator pit sites where free product has been detected in the area of our former pit. At all of these sites, an upgradient source or release point has been identified. Of all the free product sites PNM has encountered to date, the Hampton 4M is the only site where we have seen this volume of free product present.

Q. HAVE YOU PREPARED AN EXHIBIT WHICH COMPARES THE SITUATION AT THE HAMPTON 4M SITE WITH OTHER PNM GROUND WATER SITES?

A. Yes. PNM Exhibit 25 compares the situation at the Hampton 4M site with other PNM dehydrator pit sites and specifically those having free product. As you can see, the Hampton 4M site is considered atypical in terms of the extent of contamination and the length of time to achieve remediation. The contaminant plume length at sites where only dissolved phase contamination exists in groundwater usually extends no more than 50 feet beyond the source area. And as discussed previously, clean up and closure of these sites occur within 18 months to two years. At sites where free product has impacted groundwater, the plume length averages 100 to 300 feet beyond the well pad. The Hampton 4M plume length is at least 1,000 feet from the well pad location.

To date, PNM has reached closure on only one free product site. At this location, the OCD ruled that free product was not the result of PNM's former pit and allowed PNM to close the pit. However, the operator on site is still managing hydrocarbon contamination in groundwater in the area of its production fluids tank and downgradient of its operations. The remaining free product sites PNM is currently managing were discovered (on average) two to three years ago and have shown no attenuation over time.

Q. PLEASE SUMMARIZE THE FREE PRODUCT SITUATION AT THE HAMPTON 4M SITE?

A. At the Hampton 4M site, we found a four-to-five-foot thick layer of free-phase liquid hydrocarbon product at the top of the water table. This was detected during PNM's remediation efforts because PNM was, at the time, the only entity performing any pit characterization or cleanup activities at the site.

We did not discover groundwater contamination when we remediated the former PNM pit, which was the discharge pit for the wastewater from the dehydrator. The dehydrator was operated by Williams at the time of the initiation of PNM's remediation activities in April 1996 but had been owned and operated by PNM or its predecessors until June 30, 1995.

Q. IS THERE ANYTHING UNUSUAL ABOUT THE LAYOUT OF THE HAMPTON 4M SITE AS COMPARED TO MOST SITES WHERE PNM HAS CONDUCTED SOILS REMEDIATION ACTIVITIES?

A. As mentioned previously, the configuration of the well pad at the Hampton 4M is quite constrained, since it is on the edge of a wash and the well pad is fill material on a relatively steep slope. The pit associated with PNM's former dehydrator discharges was in fill material, near the steeply sloped edge of the well pad. See Exhibit 4 for a depiction of the well pad layout as a dual completion well at the time that PNM initiated its pit closure activities at the site.

Q. PLEASE IDENTIFY PNM EXHIBIT 26.

A. This was another progress report to OCD submitted August 11, 1998. Since this was an atypical site, PNM was concerned about keeping OCD up to date on what was going on. The progress report discusses our activities to date and relates our concerns about upgradient sources at the site. This is a status report indicating compliance with our groundwater management plan.

Q. PLEASE EXPLAIN EXHIBIT ~~27~~ 19. as per testimony 8/26/99

A. This is the letter from OCD dated August 27, 1998, directing PNM and Burlington to conduct a downgradient investigation. The letter also requested that PNM and Burlington work together to accomplish this. A similar letter of the same date was sent to Burlington and is attached as PNM Exhibit ~~28~~ 32.

Q. DID YOU HAVE ANY DISCUSSIONS WITH ANYONE AT OCD ABOUT THE LETTER WHICH IS FOUND AT PNM EXHIBIT ~~27~~? 19 as per test. 8/26/99

A. PNM received a letter indicating that OCD was directing PNM to conduct a downgradient investigation. I called Bill Olson and told him that we did not agree with the letter. We believed that other sources on site were contributing to downgradient contamination and that both Burlington and PNM needed to be involved in any additional investigation.

Q. PLEASE REFER TO PNM EXHIBIT 6. WHAT WAS THE LINE OF DEMARCATION THAT THE OCD DREW GEOGRAPHICALLY TO SEPARATE THE RESPONSIBILITY OF BURLINGTON FROM PNM?

A. The line was drawn between PNM's former dehydrators and Burlington's previous test wells, TPW-1 and TPW-2. This "line in the sand" was based on the physical location of surface equipment and the results of all of the borings and wells to that point in time.

Q. IS THERE NECESSARILY ANY CORRELATION BETWEEN THE LOCATION OF SURFACE EQUIPMENT AND THE ORIGINAL SOURCE OR RELEASE POINT FOR CONTAMINATION?

A. No. Typically, on site surface equipment is moved several times throughout the operating life of a gas well head. Producers and pipeline companies often rework the sites; thus, surface equipment cannot be accurately used as a point of reference for defining source areas. In addition, because ground water flows with the gradient, contamination flows from its release point. The physical location of equipment or operations is not a valid indicator of the source or release point(s) of contamination where you have ground water flow. We have fairly active ground water flow at the Hampton 4M site which travels from Burlington's side of the pad to PNM's former side of the pad. Throughout the time we have been at Hampton 4M site, we have noted the movement and relocation of Burlington's equipment on more than one occasion on the south side of the well pad. These potential source areas have never been fully characterized by Burlington through adequate investigation that should involve a sufficient number and strategic placement of groundwater monitoring wells and soil borings.

Q. WHAT ARE PNM'S IMMEDIATE FUTURE PLANS WITH REGARD TO THE HAMPTON 4M SITE?

A. PNM will continue to implement the approach in our groundwater management plan that has already been approved by the OCD. However, since the release point or source of the free product contamination at the Hampton 4M has yet to be identified, PNM is limited in our options at the site. We have re-established our former source well (now MW-12) and continue to monitor it and other remaining wells. The monitoring of MW- 12 is crucial in assisting to assist in determining the present and future conditions at the site.

Q. WHY WILL THIS WELL BE CRUCIAL TO THAT DETERMINATION?

A. Burlington has represented to PNM that they have determined definitively that the former PNM pit was a release point and a source of free product contamination at the Hampton 4M. Burlington has also indicated that their remediation efforts late in 1998 and early in 1999, which concentrated on removing all materials in and near the location of PNM's former pit, down to and into the groundwater, have successfully addressed the free product contamination at this site. MW-12 will serve as a critical data source to determine the conditions upgradient of our former pit which has now been completely removed during two separate remediation efforts.

Q. DOES PNM AGREE WITH BURLINGTON'S POSITION REGARDING THE SOURCE OF THE FREE PRODUCT PRESENTLY FLOATING ON THE GROUNDWATER AT THE SITE AND REGARDING THE EFFECTIVENESS OF BURLINGTON'S REMEDIATION EFFORTS?

A. No. PNM had already identified significant amounts of free product contamination substantially upgradient of PNM's former pit prior to Burlington's remediation efforts. PNM has also identified significant shortages in the reported volumes of hydrocarbon fluids reported by Burlington to the OCD, and Burlington has yet to investigate these suspected free product releases.

Thus, PNM disputes whether Burlington's remediation efforts have in fact been effective, since there is likely either a continuing release of free product at the site or a large volume of free product still residing in the vadose zone at the site upgradient from PNM's former operations, or both.

Q. WHAT WOULD BE AN INDICATION THAT PNM'S THEORY REGARDING THE RELEASE POINT OR SOURCE OF FREE PRODUCT AT THE SITE IS CORRECT?

A. There are three key indicators that, should they occur, will support PNM's theory: (1) The appearance of free product in either PNM's source well or the monitoring wells that are upgradient of PNM's former operations at the site; (2) An upward trend in dissolved-phase contamination over time in those wells, or (3) A shift in

the benzene-toluene-ethylbenzene-xylenes (BTEX) ratios where the ratio of benzene to other constituents is increasing.

Q. WHAT IS THE PROBABILITY THAT SOMEHOW, THE OCCURRENCE OF THESE INDICATORS COULD HAVE RESULTED FROM DISCHARGES BY PNM TO PNM'S PIT PRIOR TO JUNE 30, 1995?

A. The probability that any remaining free product at this site as well as the free product detected and removed by PNM during earlier remediation efforts resulted from discharges to PNM's pit is vanishingly small.

Q. HAS PNM SUBMITTED A REQUEST TO THE OCD TO HAVE THE FORMER DEHYDRATION PIT AT THE HAMPTON 4M SITE CLOSED?

A. Yes we have. A copy of PNM's closure report dated November 12, 1998 is presented in PNM Exhibit 29. This report was hand delivered to Bill Olson at the Hampton 4M site in November 1998. For the purpose of pit closure, PNM referenced upgradient well concentrations as remediation clean-up levels for groundwater at the site. PNM had successfully remediated soil and groundwater in the area of the former pit based upon BTEX concentrations (free phase floating product) in upgradient groundwater monitoring wells, Mw-4, -8 and –10. PNM has received no response from the OCD on our request for closure.

In support of our request for pit closure, Burlington, as a result of its mass excavation from November 1998 through February 1999, has completely removed any potential sources of contamination from PNM's former pit.

Q. OTHER THAN THE EXHIBITS YOU HAVE ALREADY ADDRESSED, ARE THERE OTHER EXHIBITS YOU WISH TO SPONSOR?

A. Yes. As indicated previously, a number of exhibits have been developed in the course of the investigation and remediation efforts at the Hampton 4M site. PNM, Burlington and the OCD have correspondence and reports relating to this site. The Commission should have the opportunity to review these materials in its deliberations in this matter. Therefore, I am identifying and confirming the genuineness of the following PNM Exhibits:

• PNM Ex 27 OCD letter to PNM 9/1/98 } as per testimony
" " 28 " " " Burlington 9/1/98 8/26/99

- PNM EXHIBIT 30- Burlington Letter of 4-15-98 to OCD
- PNM EXHIBIT 31- Burlington Report of August 1997
- PNM EXHIBIT 32- OCD Letter of 8-27-97 to Burlington
- PNM EXHIBIT 33- Burlington Letter of 9-9-97 to OCD
- PNM EXHIBIT 34- Burlington Letter Report of 9-19-97 to OCD
- PNM EXHIBIT 35- OCD Letter of 11-24-97 to Burlington
- PNM EXHIBIT 36- Burlington Letter Report of 1-30-98 to OCD
- PNM EXHIBIT 37- Burlington Letter Report of 5-28-98 to OCD

- PNM EXHIBIT 38- PNM letter of 6-25-98 to OCD
- PNM EXHIBIT 39- PNM Letter of 6-25-98 to Burlington

Q. MS. GANNON, HAVE THE OPINIONS YOU HAVE PROVIDED IN THIS TESTIMONY BEEN BASED UPON YOU EDUCATION, TRAINING AND EXPERIENCE IN THE ENVIRONMENTAL FIELD?

A. Yes they have.

Q. AND ARE YOU OPINIONS BASED ON A REASONABLE SCIENTIFIC CERTAINTY?

A. Yes they are.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

extraneous
inadvertantly included
by PNM
as per testimony
8/26/99

Mr. Bill Merhege
Acting Assistant Field Manager
Bureau of Land Management
1800 Marquess
Las Cruces, NM 88005-3371

RE: Right-0f Way NMNM-86760 (Chamberino M/L Project)

Dear Mr. Merhege:

Reclamation activities within the above-referenced right-of-way have been completed. As recommended in the Reclamation/Reseeding Guidelines for Mimbres Resource Area the reseeding was performed during the month of June. Reseeding was started on June 9, 1999 and concluded June 17, 1999. Flynt Energy Construction Co. from Odessa, Texas, Public Service Company of New Mexico-Gas Services' prime contractor, performed the reseeding work.

Prior to seeding the right-of-way surface was disced to provide a rough surface. Next, the area was seeded using a rangeland type seed drill to insure proper seed placement to promote establishment. Mulching was not applied.

The seed mixture applied is consistent with the guidelines for Mimbres Resource Area. Attached is a copy of the seed bag label. Also attached are copies of four (4) photographs that show the equipment utilized and typical final surface/grade.

If you need additional information about this project call me at (505)241-4873 or Douglas Campbell at (505)241-2025

Cordially,

Wilford B. Nez

Sr. Engineering Tech

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION COMMISSION

IN THE MATTER OF THE HEARING CALLED
BY THE OIL CONSERVATION COMMISSION
FOR THE PURPOSE OF CONSIDERING:

APPLICATION OF PUBLIC SERVICE COMPANY OF NEW MEXICO FOR *DE NOVO* HEARING ON ORDER NO. R-11134 ISSUED BY THE NEW MEXICO OIL CONSERVATION DIVISION IN

CASE NO. 12,033

AFFIDAVIT

STATE OF NEW MEXICO)
)SS.
COUNTY OF BERNALILLO)

I, Maureen Gannon, upon being first duly sworn according to law, under oath, depose and state: That I am Manager of Pit Media Program for Public Service Company of New Mexico, and that I have read the foregoing Direct Testimony, including exhibits. I further affirmatively state that I know the contents thereof and that they are true and correct to the best of my knowledge and belief.

SIGNED this 9 day of July, 1999.

Maureen Gannon
MAUREEN GANNON

SUBSCRIBED AND SWORN to before me this 9th day of July, 1999.

(Seal, if any)

Notary Public

[My Commission Expires: Oct. 22, 1999]

DAM0258

BEFORE THE

NEW MEXICO ENERGY, MINERALS AND NATURAL RESOURCES

OIL CONSERVATION COMMISSION

**IN THE MATTER OF THE APPLICATION OF
PUBLIC SERVICE COMPANY OF NEW MEXICO
FOR REVIEW OF OIL CONSERVATION DIVISION
DIRECTIVE DATED MARCH 13, 1998
DIRECTING APPLICANT TO PERFORM
ADDITIONAL REMEDIATION FOR
HYDROCARBON CONTAMINATION,
SAN JUAN BASIN, NEW MEXICO** **CASE NO. 12033**

DIRECT TESTIMONY OF

RODNEY HEATH

SUBMITTED ON BEHALF OF

PUBLIC SERVICE COMPANY OF NEW MEXICO

APPLICANT

JULY 9, 1999

OCC CASE NO. 12033
DIRECT TESTIMONY OF
RODNEY HEATH

Q. PLEASE STATE YOUR NAME AND PLACE OF EMPLOYMENT FOR THE RECORD?

A. Rodney Thomas Heath. I'm the president of Petro Energy, Incorporated, P.O. Box 701, Farmington, New Mexico.

Q. AND ON WHOSE BEHALF ARE YOU PROVIDING TESTIMONY IN THIS PROCEEDING?

A. I am providing testimony on behalf of Public Service Company of New Mexico ("PNM").

Q. CAN YOU PLEASE BRIEFLY SUMMARIZE YOUR TESTIMONY IN THIS CASE?

A. Yes. My testimony addresses the general history of natural gas production surface equipment in the San Juan Basin. I also discuss the operational aspects of the surface equipment at the Hampton 4M well site and provide the conclusion that very little free product could have originated from PNM's former dehydrators at this site. I further confirm that any free product that might have flowed to PNM's former dehydration pit could have only been the result of problems with the operation of Burlington's equipment and that this free product is owned by Burlington or its predecessor. Finally, I explore an apparent anomaly in the gas-oil ratio production history relating to Burlington's production from the Hampton 4M well.

Q. CAN YOU TELL US WHAT KIND OF BUSINESS PETRO ENERGY IS?

A. PetroEnergy is a small production company. We have our own production wells, with some partners. We are also involved in developing certain patents.

Q. WHAT ARE YOUR JOB DUTIES AS PRESIDENT OF PETRO ENERGY?

A. I am in charge of the day-to-day management of the company.

Q. PLEASE TELL THE COMMISSION ABOUT YOUR EDUCATIONAL BACKGROUND.

A. I have a Bachelor of Science in mechanical engineering from Texas A&M University. I graduated in June of 1954.

Q. FOLLOWING GRADUATION IN 1954 FROM TEXAS A&M, WHAT DID YOU DO?

A. I immediately went to work for Southern Union Gas Company in Farmington, New Mexico.

Q. WHAT POSTIONS DID YOU HOLD WITH SOUTHERN UNION?

A. I was with Southern Union from June of 1954 through June of 1961 and held a number of different positions. I started as a measurement superintendent.

Q. WHAT ARE THE JOB DUTIES OF A MEASURMENT SUPERINTENDENT?

A. They include a number of things including measuring the gas, determining the specific gravity of the gas and supervising and auditing the related charts.

Q. WHAT OTHER POSTIONS DID YOU HOLD WITH SOUTHERN UNION?

A. I was prorationing superintendent for a period. This was when prorationing first started in this area. I had the job of controlling the production of the wells, including determining which wells were to remain on and which wells were to remain off. I also developed a system for estimating the amount of days the wells had to produce to comply with prorationing requirements. I was in on the ground floor in developing the prorationing system.

The last job I had with Southern Union was as production superintendent. While in this position, I was responsible for all of the Southern Union gathering systems. I oversaw the operation of Southern Union's wells, as well as the operation of all of equipment and the measurement of product produced from the wells. I also specified the sizing of all equipment required to connect the wells. This included equipment layout, installation and location at the well pad.

Q. AS PRODUCTION SUPERINTENDENT WERE YOU THE PERSON RESPONSIBLE FOR SETTING UP THE WELL PAD SITE AND THE SURFACE EQUIPMENT AT THE WELL PAD?

A. Yes.

Q WHERE DID YOU DO YOUR WORK FOR SOUTHERN UNION?

A. All my work for Southern Union was in the San Juan Basin.

Q. IS THIS THE SAME SAN JUAN BASIN WHERE THE HAMPTON 4M WELL IS LOCATED?

A. Yes it is.

Q. AFTER YOU LEFT EMPLOYMENT WITH SOUTHERN UNION IN 1961, WHAT DID YOU DO?

A. I became president of Olman Heath Company.

Q. WHAT KIND OF BUSINESS WAS OLMAN HEATH?

A. Olman Heath was specifically organized to manufacture and sell the combination production unit that I had patented. It eventually grew into a full-blown production-equipment company as well. I became president of Olman Heath in June of 1961. I was part of management for Olman Heath and its successor companies until February of 1995.

Q. YOU INDICATED THAT YOU DEVELOPED A PATENT FOR A PIECE OF EQUIPMENT CALLED A COMBINATION PRODUCTION UNIT. IS THAT SOMETHING THAT'S COMMONLY REFERRED TO IN OILFIELD PARLANCE AS A "SEPARATOR?"

A. Yes, but it is important to note that a combination production unit includes more components than just a separator and performs more functions than just separating liquids from gas. A combination production unit also provides the heat to turn the well on, controls the pressures, and generally processes the liquid in some way. It's more than just a separator, although that's what many folks commonly call it.

Q. THROUGHOUT THE TESTIMONY IN THIS CASE, A NUMBER OF PNM WITNESSES AND PNM EXHIBITS REFER TO A "SEPEARATOR" ON BURLINGTON'S PART OF THE WELL PAD. DO YOU

UNDERSTAND THESE AS REFERENCES AS REFERRING TO A COMBINATION PRODUCTION UNIT AS YOU DESCRIBED IT?

A. Yes, but I prefer to call it a combination production unit because it performs many different functions as I have just described.

Q. IS THE COMBINATION PRODUCTION UNIT THAT WAS USED AT THE HAMPTON 4M WELL PAD SITE SIMILAR TO THE ONE YOU DEVELOPED?

A. The combination production unit at the Hampton 4M well is one that I designed and patented.

Q. THERE HAS ALSO BEEN DISCUSSION IN THE TESTIMONY IN THIS CASE CONCERNING A PIECE OF EQUIPMENT AT THE HAMPTON 4M WELL SITE CALLED A DEHYDRATOR. DID YOU HAVE ANY INVOLVEMENT IN THE DEVELOPMENT OF THAT EQUIPMENT?

A. Yes, I designed that dehydrator as well.

Q. ARE THERE OTHER PIECES OF OILFIELD-RELATED EQUIPMENT THAT YOU HAVE DESIGNED?

A. Yes. I hold in excess of 20 patents on different pieces of equipment.

Q. DID OLMAN HEATH MANUFACTURE OILFIELD EQUIPMENT?

A Yes it did. Olman Heath manufactured several pieces of oil field equipment including combination production units, separators, scrubbers, heaters, treaters and dehydrators.

Q. WHAT IS THE BRAND NAME ASSOCIATED WITH THE COMBINATION PRODUCTION UNIT AT THE HAMPTON 4M WELL?

A. It has the Weatherford brand name on it, but it is an Olman Heath design. In December 1981, Weatherford US acquired Olman Heath Company. At that time I became the vice president and operating manager for Weatherford. In January of 1986 the company was reorganized and became U.S. Enertek and continued as U.S. Enertek through February 1995.

Q. DO YOU KNOW THE BRAND NAME THAT'S ASSOCIATED WITH THE GAS DEHYDRATOR?

A. It's also a Weatherford and is also a Olman Heath design.

Q. IS IT CORRECT THAT YOUR COMPANY WAS THE MANUFACTURER FOR BOTH THE COMBINATION PRODUCTION UNIT AND THE DEHYDRATOR AT THE HAMPTON 4M WELL SITE?

A. Yes.

Q MR. HEATH, YOU TESTIFIED THAT YOU STARTED IN THE OIL BUSINESS IN THE SAN JUAN BASIN IN 1954. HAVE YOU BEEN CONTIUOUSLY INVOLVED IN THE BUSINESS SINCE THAT TIME?

A. Yes I have.

Q. AND AS I UNDERSTAND IT, YOU HAVE BEEN INVOLVED IN THE OIL FIELD PRODUCTION EQUIPMENT BUSINESS SINCE 1961, IS THAT ALSO CORRECT?

A. Yes it is.

Q. BASED ON THIS EXPERIENCE, CAN YOU GIVE US SOME OF THE HISTORY OF HOW THINGS DEVELOPED OUT IN THE SAN JUAN BASIN WITH RESPECT TO OILFIELD PRODUCTION EQUIPMENT?

A. Yes. The history in the San Juan Basin is actually very relevant to the issues in this case. When I first went to work for Southern Union in the mid 1950s, production from the Dakota formation was not fully under way. We were not hooking up many Dakota wells at that time. Production was primarily from the Mesaverde and the Pictured Cliff formations.

The production contracts that were used at that time specified that Southern Union would install all of the surface equipment at the well pad, including tanks for storage of liquids, which is also commonly called free product. Southern Union would collect the free product and share it on a 50-50 basis with the operator.

Q. DID THINGS CHANGE WHEN PRODUCTION FROM THE DAKOTA FORMATION BECAME MORE COMMON?

A. Yes. When the Dakota production increased, we started dealing with higher pressures. In addition, the wells produced large volumes of free product. In fact, production of several hundred barrels a day was not uncommon.

Because of the large volumes of free product produced from the Dakota formation, the producers became reluctant to share the free product with Southern

Union. The producers wanted to install their own equipment to capture the free product and keep the profits from the sale of the product themselves.

Q. WHAT IMPACT DID THIS HAVE ON THE PROVISIONS OF THE PRODUCTION CONTRACTS COMMONLY USED IN THE SAN JUAN BASIN?

A. We began drawing up contracts that provided that the producer would install its own equipment to recover the free product. The producers retained all rights to the free product and got to keep the proceeds from the sale of the free product. However, the contracts were also changed so that producers were now required to provide gas basically free of any free product.

Q. HOW DID THIS ARRANGEMENT WORK OUT?

A. There were problems initially. One problem was that the equipment used by the producers would not really remove all of the free product. In many cases, large slugs of free product would still get through the operators' production units and would flow through to the dehydrators.

Initially, in order to protect our dehydration equipment, Southern Union installed dehydrators that were equipped with elaborate separators. Southern Union's equipment would then discharge the liquids into a tank owned by the producers. Southern Union was actually equipping the wells with the equipment necessary to remove the free product, but wasn't getting any of the revenue from the sale of the product. It was a good deal for the producers, but not for Southern Union.

Q. WHY DID SOUTHERN UNION INSTALL THIS EQUIPMENT?

A. Because you have to remove the free product to dehydrate the gas. Hydrocarbons entering a dehydrator system will cause an upset though loss of glycol. A dehydrator simply won't tolerate large volumes of free product. Dehydrators can tolerate only very small amounts of free product before you get foaming glycol which causes a loss of glycol.

Q. WHY IS THIS LOSS OF GLYCOL A PROBLEM?

A. For one thing, glycol is very expensive. And secondly, if you lose your glycol you lose your ability to dehydrate the gas. Keeping your glycol clean and not losing it is a major operational concern.

Q. WHY IS IT NECESSARY TO DEHYDRATE GAS?

A. To remove the water vapor from the gas so it won't cause operational problems. Water vapor can cause hydrates to form in the pipeline. This can cause the lines to freeze and gas can't pass through the lines. In order to get the hydrates out of the pipeline, you generally have to "blow down" the system. When you do this, you lose all the gas that's contained in that pipeline. Dehydrators are installed to minimize these problems.

Q. YOU'VE BROUGHT US UP TO THE POINT IN HISTORY WHERE SOUTHERN UNION HAD INSTALLED SOME FAIRLY SOPHISTICATED DEHYDRATION EQUIPMENT ON ITS FACILITIES. TELL US WHAT HAPPENED AFTER THAT.

A. When the Southern Union management began to discover how much it was costing to hook these wells up and how much money the company was spending on equipment, they decided they wanted a different solution for preventing excessive free product from hitting the dehydrators.

Q. WHAT WAS DONE TO TRY A DIFFERENT SOLUTION?

A. I arrived at the idea of installing a sensing element on the dehydrators. The sensing element measured the amount of free product that hit the dehydrator. If excess free product hit the dehydrator, the sensing element would activate a switch and shut in the well. The well would remain shut in until the problem causing the excess free product was corrected.

Q. I'D LIKE TO HAVE YOU LOOK AT WHAT WE'VE MARKED AS PNM EXHIBIT 40. CAN YOU TELL US WHAT WE HAVE DEPICTED ON EXHIBIT 40?

A. It's photograph of the actual combination production unit that was installed on the Hampton 4M when I went to inspect the well pad equipment. It also shows a schematic of the combination production unit.

Q. CAN YOU TELL US THE FUNCTION OF THIS PIECE OF EQUIPMENT IN THE WHOLE PROCESS OF NATURAL GAS PRODUCTION?

A. As discussed, although this piece of equipment is commonly referred to as a separator, it performs a variety of functions. This piece of equipment provides

heat for operating and turning on the well. It also controls any overpressure and separates the free product coming into the unit.

Q. WHAT ARE THE EFFICIENCY RATES OF SEPARATORS IN REMOVING FREE PRODUCT FROM THE GAS?

A. A separator will remove in excess of ninety-nine percent of the free product from the gas.

Q. IS NINTY-NINE PERCENT REMOVAL THE LOWEST ACCEPTABLE LEVEL OF PERFORMANCE FOR A SEPARATOR?

A. Actually, you would not be satisfied with only a ninety-nine percent removal rate. The efficiency rate is very close to one-hundred percent on a properly functioning unit.

Q. IF THE COMBINATION PRODUCTION UNIT, OR SEPARATOR AS WE SOEMTIMES CALL IT, IS OPERATED PROPERLY, WOULD YOU EXPECT TO GET MUCH IN THE WAY OF FREE PRODUCT DOWNLINE IN THE DEHYDRATORS?

A. No. There would be very little free product reaching the dehydrators. As I indicated before, almost one hundred percent of the free product is removed by the combination production unit (separator) under normal circumstances.

Q. PLEASE REFER TO PNM EXHIBIT 41 AND TELL US WHAT IS SHOWN IN THIS EXHIBIT.

A. PNM Exhibit 41 is a picture of the dehydrator that was installed on the Hampton 4 when I visited the site. It too provides a schematic of a typical dehydrator.

Q PLEASE TELL US THE PURPOSE OF THE DEHYDRATOR.

A. As discussed previously, it is designed to remove water vapor from the gas. I want to emphasize, it is designed to deal with water vapor only. It is not intended to remove free product from the gas. The producer has the responsibility for and control over removal of free product before the gas reaches the dehydrator. Almost all of the free product should be removed by the combination production unit before the gas reaches the dehydrator.

Q. HOW DOES THE DEHYDRATOR WORK?

A. The dehydrator itself is composed of an absorber, a reboiler, a heat exchanger and some type of a pump to lift the glycol up against the pressure. It also has a contact system to remove the water vapor.

Q. IS THERE ALSO A SMALL SEPARATOR ASSOCIATED WITH THE DEHYDRATOR THAT'S SHOWN IN PNM EXHIBIT 41?

A. Yes. There is a small separator on the dehydrator with a sensing-element. I'd like to point out that this is not a full separator as used in the combination production unit. This separator is designed to handle only very minimal amounts of free product. Indeed, this sensing element separator is designed to shut in the well if too much free product hits the dehydrator

Q. CAN YOU PLEASE TAKE US THROUGH THE PROCESS FROM THE POINT THAT THE GAS COMES OUT OF THE WELLHEAD AND THEN RUNS THROUGH THE SURFACE EQUIPMENT TO THE METER HOUSE.

A. Yes. The easiest way to do this is to refer to the schematic in PNM Exhibit 42, The wellhead is shown in the schematic and the slashed line is the gas flow. The gas flows from the well head to the combination production unit, or separator. The combination production unit has a method of controlling the gas temperature. It also has a device to control pressure. The gas flows through this equipment and then up into a high-pressure two-phase separator, where the total liquids, including free product, are knocked out, collected, and then dumped back into this low-pressure vessel. The liquids are then collected in a tank. The gas flows out of this vessel on the combination production unit and, in the case of the Hampton 4M, flows into what we call the sensing element separator on the dehydrator. Provided there is not too much free product in the gas, the gas passes through the sensing element separator into the absorber. In the absorber the gas is contacted with glycol where any moisture is removed and flows to a tank. The gas then passes through the meter run and on down to the pipeline.

Q. IN THE SITUATION AS WE HAVE OUT AT THE HAMPTON 4M WELL, AT WHAT POINT DOES TITLE OF THE GAS PASS FROM THE PRODUCER TO THE PIPELINE COMPANY?

A. The title to the gas passes when it flows through the orifice in the meter run.

Q. IN THE EVENT THERE IS A SUBSTANTIAL AMOUNT OF FREE PRODUCT THAT SOMEHOW WASN'T CAPTURED BY THE SEPARATOR AND HEADS DOWN THE LINE TO THE DEHYDRATOR, PLEASE TELL US WHAT WOULD HAPPEN?

A. If any substantial amount of free product hits the dehydrator, the output pressure of the liquid level control builds in the sensing element separator. If the pressure builds too much, there is a three-way switch that is tripped and sends a signal to a valve to shut the well in.

Q. WHAT DOES THAT MEAN IN TERMS OF THE VOLUMES OF FREE PRODUCT THAT WOULD LIKELY RUN THROUGH A DEHYDRATOR AND BE DISCHARGED?

A. As noted before, there would only be relatively small amounts of free product that would hit the dehydrator. If the amount were too great, the well would be shut in. This would in turn would stop production of the free product.

Q. ARE YOU SUGGESTING THAT NO FREE PRODUCT WOULD EVER BE DISCHARGED FROM THE DEHYDRATOR?

A. No. However, the amount that would be discharged would be very small. In addition, the amount that would actually hit the ground and be absorbed in the soil would be even smaller.

Q. CAN YOU EXPLAIN WHAT YOU MEAN WHEN YOU SAY THAT THE AMOUNT OF FREE PRODUCT FROM THE DEHYDRATOR THAT WOULD ACTUALLY HIT THE GROUND AND BE ABSORBED IN THE SOIL WOULD BE EVEN SMALLER?

A. This is a key point actually. Any discharge from the dehydrator would be under pressure. This is particularly true with respect to Dakota production, which is a very high vapor pressure product. When you have an elevated line pressure, the function of reducing that pressure from the flowing line pressure down to atmospheric pressure, creates a flash of the product.

Q. WHAT DO YOU MEAN BY "FLASH OF THE PRODUCT"?

A. It means that much of the free product is "flashed off", or volatilized, into the atmosphere. It never even hits the ground.

Q. DO YOU HAVE AN ESTIMATE OF HOW MUCH FREE PRODUCT DISCHARGED THROUGH THE DEHYDRATOR WOULD HAVE BEEN EXPOSED TO THE SOIL?

Yes. I have performed modeling on wells where we took the product from the high-pressure separator down to the product tank. The modeling results show that 50 to 60 percent of what is contained in the high-pressure separator at the time it is dumped to the low pressure tank is flashed into the atmosphere. In addition, much of any product that actually makes it to a pit would also flash off to the atmosphere as it weathered in the pit. Free product is volatile and will evaporate

rather quickly before it is absorbed in the ground. So even if free product was discharged, a substantial portion of the free product would never enter the soil, let alone reach the ground water in a free phase state.

Q. YOU INDICATED THAT THERE WOULD BE SOME DISCHARGE OF FREE PRODUCT FROM THE DEHYDRATOR IN EVEN NORMAL OPERATIONS. HOWEVER, WOULD YOU EXPECT THE DUMPING OF FREE PRODUCT TO OCCUR WITH MUCH FREQUENCY?

A. No, not unless there was some type of mechanical failure upstream in Burlington's combination production unit.

Q. IF BURLINGTON'S COMBINATION PRODUCTION UNIT IS OPERATING PROPERLY, WOULD YOU EXPECT TO SEE MUCH FREE PRODUCT REACH THE DEHYDRATOR?

A. No. Again, nearly one hundred percent of the free product would have been removed before the gas reached the dehydrator.

Q. WHAT DOES THAT MEAN WITH REGARD TO THE POTENTIAL VOLUMES THAT COULD HAVE BEEN DISCHARGED BY PNM'S FORMER DEHYDRATION UNIT?

A. The volumes would be very small, because during normal operations there should have been very little free product carrying over. In addition, even if Burlington experienced any type of mechanical failure resulting in large amounts of free product, the sensing element would shut the well in.

Q. CAN YOU TELL US WHO CONTROLS THE COMBINATION PRODUCTION UNIT?

A. Burlington, as the producer, has control over this equipment and the recovery of the free product from the gas. PNM would have had no control over the operation of this equipment at all.

Q. HAVE YOU DONE ANY INVESTIGATION INTO THE OPERATIONAL HISTORY OF THE EQUIPMENT AT THIS SITE?

A. Yes. I wanted to find out what experience they had had with operating, not only dehydrators, but the experiences they had with the whole system. I actually interviewed the field men for the Hampton 4M well to get an idea of the operational history of the equipment. One of the field men that had operated the equipment prior to 1995 told me that on occasion he found the well shut in from the sensing elements.

Q. WHAT DOES THAT INDICATE TO YOU ABOUT THE OPERATION OF THE EQUIPMENT?

A. Well, it means two things. First, it would indicate that something had malfunctioned on Burlington's equipment to cause excessive free product to hit the dehydrator. Second it would also suggest that the sensing element on the dehydrator was working properly and shutting in the well when too much free product was flowing. This would stop the discharge of free product to the pit.

Q. DID YOU ALSO ASK ABOUT HOW THE DEHYDRATOR WAS OPERATING?

A. Yes. The field man said that he had no operating problems at all with the dehydrator. There was no excessive glycol loss or anything like that.

Q. WHY IS THAT SIGNIFICANT, THIS EXCESSIVE GLYCOL LOSS?

A As I said before, glycol loss occurs when there is excessive free product hitting the dehydrator. The fact that there was no significant glycol loss shows two things. First, there probably were not too many instances where large volumes of free product hit the dehydrator. Second, on those occasions when free product did hit the dehydrator, the sensing element did a good job of shutting in the well.

Q. WHAT DOES THAT MEAN WITH REGARD TO THE AMOUNTS OF FREE PRODUCT THAT MIGHT HAVE BEEN DISCHARGED THROUGH THE DEHYDRATORS?

A. If you had large amounts of free product running through the dehydrator, you would expect to have large glycol loss. There was no large glycol loss, so we can conclude that there were no large free product discharges from the dehydrator. None of the three field men I talked two -- two of them had operated after 1995 and one of them prior to 1995 -- had any problems with the dehydrators. One of the field men testified it was the best unit he had on the ground.

Q. BASED UPON YOUR INSPECTION OF THE EQUIPMENT AND THE DISCUSSIONS YOU HAD WITH THE FIELD MEN, WAS THERE

ANYTHING TO INDICATE THAT THE COMBINATION UNIT WASN'T OPERATING AS IT WAS INTENDED AT A VERY HIGH EFFICIENCY OF 99 PERCENT OR MORE?

A. The only indication that there were any problems at all with any of the equipment, as far as what the field men knew, was that one of them testified that he found the well shut in on occasion. The other field men said that after 1995 they did not experience any problems with the well being shut in, nor did they observe free product in the pit during that time frame.

Q. CAN YOU DRAW ANY CONCLUSIONS BASED UPON THAT IN TERMS OF THE RELATIVE VOLUMES THAT MIGHT HAVE COME THROUGH PNM'S DEHYDRATOR?

A. The conclusions I can draw are that PNM's former unit was operating the way it was designed and there was no significant discharge of free product from the dehydrator.

Q. IF THERE WERE A PROBLEM WITH THE EFFICIENCY OF THE COMBINATION PRODUCTION UNIT, WHOSE RESPONSIBILITY WOULD THAT BE?

A. It would be Burlington's responsibility, as the operator of the equipment.

Q. IS FREE PRODUCT SOMETHING THAT A PIPELINE COMPANY WANTS THROUGH ITS DEHYDRATOR?

Absolutely not. The dehydrator is not designed to deal with excessive amounts of free product. Any free product that comes over creates a problem for the pipeline company.

Q. DID YOU DO ANY OTHER INVESTIGATION WITH RESPECT TO THE HISTORY OF THE HAMPTON 4M WELL?

A. Yes. I looked at the production history of the well for both gas and free product. The production history for this well shows a significant anomaly in terms of the production ratio between gas and free product.

Q. DID YOU PREPARE ANY EXHIBITS TO ILLUSTRATE THIS?

A. Yes, I prepared PNM Exhibit 43. This exhibit is a comparison of the gas-oil ratio on both the Mesaverde formation and the Dakota formation. This exhibit is based on actual production figures for the Hampton 4M well. The actual production figures for the well are shown on PNM Exhibit 44.

Q. PLEASE EXPLAIN WHAT IS MEANT BY A GAS AND OIL RATIO?

A. That is simply the ratio between the amount of gas produced compared to the amount of free product produced over the same period of time. What I did was just divide the volume of gas that had been produced for a given year, according to the production records, by the volume of oil that had been produced, so we determined the amount of gas per barrel of oil.

Q. WHY WAS IT THAT YOU CREATED THIS OIL-AND-GAS RATIO COMPARISON?

A. Well in looking particularly at the Mesaverde side, it looked like there were some very strange results. Burlington had some years where there was zero recovery of free product.

Q. WHEN YOU SAY "ZERO RECOVERY", WHAT DO YOU MEAN?

A. There was no reported recovery of any oil, liquid hydrocarbons, during two particular years. That is very strange because we still had gas production. It is even more strange because free product production resumed at levels close to what it was prior the period of non-production.

Q. IN YOUR EXPERIENCE, IS SOMETHING LIKE THIS FAIRLY COMMON WITH REGARD TO PRODUCTION RATIOS?

A. No. If you look at the production ratio for the Dakota formation on PNM Exhibit 43, it looks pretty typical. The ratio is fairly constant, except for two years, 1990 and 1995, which are anomalies.

Q. WHAT TYPE OF PRODUCTION RATIO WOULD YOU NORMALLY EXPECT?

A. Normally, you expect the ratio to be fairly level. Although gas-oil ratios do change, you shouldn't get dramatic swings from year to year, which is what happened at the Hampton 4M well for the Mesaverde production. You didn't really experience that on the Dakota production except in two years where it seemed like there was an anomaly. PNM Exhibit 45 is a graphic depiction of this anomaly. From 1992 to 1994, the oil/gas ratio was 6.48. In 1995, it dropped to

only 1.99. In 1996, it jumped back up to 7.04. Burlington has not provided any explanation for this production anomaly.

Q. WHAT THINGS CAN HAPPEN THAT MIGHT CAUSE THAT GAS-OIL RATIO TO DEVIATE SO MUCH?

A. Several things could have created this. One possibility is a leak in the Mesaverde tank. Alternatively, Burlington could have also changed the way they were operating the well somehow. It could have been having to blow oil into the atmosphere and wasting most of the product. Burlington could have failed to keep proper records for the production of the oil. This would seem unlikely because of the impact to royalty owners.

I can't give a probable cause for this anomaly. I can only list possibilities. However, this is an anomaly that Burlington should explain. It raises the question of whether the lost free product production shown in the gas oil ratios is somehow related to the free product that was discovered under the well pad.

Q. HAVE YOU TRIED TO FIND OUT WHAT CAUSED THIS APPARENT ANOMOLY IN THE GAS AND OIL PRODUCTION RATIO?

A. Only to a limited extent. I have reviewed the records we have relating to production from the Hampton 4M well. We really don't have enough information to make any probable determination on this point. However, the apparent lost production should raise a red flag for the regulators and they should require Burlington to explain this anomaly.

Q. DOES FREE PRODUCT HAVE ANY VALUE?

A. Yes. Free product is typically sold to oil purchasers as a hydrocarbon product such as an oil or as light ends. It can be very valuable, particularly the light ends.

Q. AS BETWEEN THE PIPELINE COMPANY AND THE PRODUCER, WHEN THE PIPELINE COMPANY IS BUYING NATURAL GAS, WHO CLAIMS OWNERSHIP IN THE FREE PRODUCT?

A. The contracts now generally provide that the producer installs their equipment and that it's their free product. The producer puts the combination production unit and related storage tanks on to recover the free product. They then sell it.

Q. DO YOU HAVE AN UNDERSTANDING AS TO HOW THE OIL CONSERVATION DIVISION ("OCD" or "DIVISION") ALLOCATED RESPONSIBILITY FOR THE INVESTIGATION AND CLEAN-UP OF FREE PRODUCT IN THE GROUND WATER AT THE HAMPTON 4 M SITE?

A. Yes. I was present at the hearing before the OCD hearing examiner where it was explained by the Division witness that the allocation was based on the physical location of the surface equipment and pits. An imaginary line was drawn on the well pad and PNM was responsible for everything north of the line and Burlington was responsible for everything south of the line. I am also aware that this original ruling was modified somewhat after the hearing before the OCD hearing examiner. The hearing examiner ruled that PNM and Burlington now

share responsibility equally for the free product and related dissolved phase product in the ground water.

Q. BASED UPON YOUR EXPERIENCE WITH OIL FIELD OPERATIONS AND EQUIPMENT, DO YOU BELIEVE THAT THESE ALLOCATIONS OF RESPONSIBILITY ARE BASED UPON SOUND OIL FIELD ENGINEERING?

A. No I don't. First, as noted above, the free product is owned by and is the responsibility of the producer. PNM does not own this free product, Burlington does. Secondly, if large amounts of free product got to PNM's former dehydrator, it could have only gotten there as a result of operational problems or equipment malfunctions in Burlington's equipment. Free product should never have reached the dehydrator in the first place and Burlington should not be allowed to escape the consequences of its poor operations. Third, based upon calculations concerning the amount of free product on the ground water provided by PNM witness Valda Terauds, the sheer volume of free product on the ground water at this site is far in excess of what you could reasonably expect to see from a dehydrator.

Q. MR HEATH, HAVE THE OPINIONS GIVEN IN YOUR TESTIMONY BEEN BASED UPON YOUR EDUCATION, TRAINING AND EXPERIENCE IN OIL FIELD OPERATIONS AND OIL FIELD EQUIPMENT?

A. Yes they have.

Q. HAVE YOUR OPINONS CONCERNING THE POTENTIAL VOLUMES OF FREE PRODUCT THAT MIGHT HAVE BEEN DISCHARGED FROM PNM'S FORMER DEHYDRATION UNIT BEEN BASED UPON A REASONABLE ENGINEERING CERTAINTY?

A. Yes they have.

Q. MR. HEATH, DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes it does.

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION COMMISSION

IN THE MATTER OF THE HEARING CALLED
BY THE OIL CONSERVATION COMMISSION
FOR THE PURPOSE OF CONSIDERING:

APPLICATION OF PUBLIC SERVICE COMPANY OF NEW MEXICO FOR *DE NOVO* HEARING ON ORDER NO. R-11134 ISSUED BY THE NEW MEXICO OIL CONSERVATION DIVISION IN

CASE NO. 12,033

AFFIDAVIT

STATE OF NEW MEXICO)
)SS.
COUNTY OF San Juan **)**

I, Rodney Thomas Heath, upon being first duly sworn according to law, under oath, depose and state: That I am President of Petro Energy, Inc., and that I have read the foregoing Direct Testimony, including exhibits. I further affirmatively state that I know the contents thereof and that they are true and correct to the best of my knowledge and belief.

SIGNED this 7th day of July, 1999.

Rodney Thomas Heath
RODNEY THOMAS HEATH

SUBSCRIBED AND SWORN to before me this 7th day of July, 1999.

(Seal, if any)

Gale Leslie
Notary Public

[My Commission Expires: 12-11-2002]

BEFORE THE

NEW MEXICO ENERGY, MINERALS AND NATURAL RESOURCES

OIL CONSERVATION COMMISSION

**IN THE MATTER OF THE APPLICATION OF
PUBLIC SERVICE COMPANY OF NEW MEXICO
FOR REVIEW OF OIL CONSERVATION DIVISION
DIRECTIVE DATED MARCH 13, 1998
DIRECTING APPLICANT TO PERFORM
ADDITIONAL REMEDIATION FOR
HYDROCARBON CONTAMINATION,
SAN JUAN BASIN, NEW MEXICO CASE NO. 12033**

DIRECT TESTIMONY OF

MARK SIKELIANOS

SUBMITTED ON BEHALF OF

PUBLIC SERVICE COMPANY OF NEW MEXICO

APPLICANT

JULY 9, 1999

CASE NO. 12033
DIRECT TESTIMONY OF
MARK J. SIKELIANOS

Q. CAN YOU PLEASE STATE YOUR NAME AND YOUR PLACE OF EMPLOYMENT?

A. My name is Mark J. Sikelianos and I am employed by Public Service Company of New Mexico ("PNM"), in its Environmental Services Department.

Q. WHAT ARE YOUR CURRENT POSITION AND JOB DUTIES WITH PNM?

A. I am a Senior Technician. I have been in this position almost four years. My job duties include overseeing all of our groundwater sites, installing monitor wells, coordinating the quarterly monitoring, collecting data, sampling wells, preparing data reports. I also oversee some of the pit excavation work that is on going and provide quality assurance to the overall project.

Q. CAN YOU TELL THE COMMISSION ABOUT YOUR EDUCATIONAL BACKGROUND AND WORK EXPERIENCE?

A. I have an Associate's Degree in petroleum production technology from Eastern New Mexico University. I just recently received my bachelor's degree in business administration from the University of Phoenix. I am a Certified Scientist with the New Mexico Environment Department ("NMED") Underground Storage Tank Bureau. I have a GS-29 technical specialty with the state for installation of groundwater remediation systems. I have attended numerous short courses on environmental remediation. Prior to coming to PNM, I worked for Geoscience Consultants for seven years performing similar environmental and groundwater work. I also have about four years of experience working for geotechnical

engineering firms such as Fox and Associates, Vineyard and Associates and the State Highway Department, working in soils labs and performing soils testing.

Q. YOU TALKED ABOUT CERTIFICATION FROM THE NMEDWITH REGARD TO UNDERGROUND STORAGE TANKS (USTS). WHAT DOES THAT CERTIFICATION ENTAIL?

A. The NMED UST Bureau requires certification for the person responsible for the direct control, and/or supervision of investigation and reclamation activities to assure that the work is performed in accordance with appropriate industry and regulatory quality standards. This individual is certified by the department to engage in the design, performance, and interpretation of investigations of vadose or saturated zone contamination caused by releases from UST's and/or the application, design, implementation, and operation of systems to remediate vadose or saturated zone contamination caused by releases from UST's.

Q. YOU HAVE THIS CERTIFICATION?

A. Yes.

Q. AND DOES THE CERTIFICATION DEAL WITH GROUND WATER REMEDIATION?

A. Yes, among other things.

Q. HAVE YOU BEEN INVOLVED IN GROUNDWATER REMEDIATION WITH REGARD TO LEAKING UNDERGROUND STORAGE TANKS?

A. Yes, I have. I provided oversight serving as the task leader on a large leaking underground storage tank site in Belen, New Mexico. This site consisted of three

different gas stations all of which had leaking underground storage tanks. We installed the wells and the remediation system. I have worked on remediation systems at the Diamond Shamrock terminal in Albuquerque and I have worked on a remediation system at the Lea Plant in Hobbs, New Mexico. I have also worked on different large-scale remediation systems at oil facilities all over the state.

Q. WHEN WE TALK ABOUT LEAKING USTS ARE WE GENERALLY TALKING ABOUT GASOLINE?

A. Yes.

Q. HOW SIMILAR OR DISSIMILAR IS GASOLINE TO WHAT WE ARE TALKING ABOUT WHEN WE TALK ABOUT FREE PRODUCT IN THIS CASE?

A. I would consider them the same or very similar. Drip or condensate, as it is known in the oil field, is free product that contains the same contaminants of concern as gasoline. Specifically, benzene, toluene, ethylbenzene and xylene, commonly known as BTEX.

Q. IN TERMS OF THE WAY THE MATERIALS MOVE IN THE SOILS AND IN THE GROUNDWATER, IS THERE ANY DIFFERENCE?

A. No, I wouldn't think so. There may be some more paraffinics in the natural oil production, which might slow migration of the free product, but other than that, no.

Q. IN TERMS OF HOW YOU MIGHT DESIGN A REMEDIATION PLAN TO ADDRESS CONTAMINATION IN SOIL AND GROUNDWATER

BETWEEN THE TWO SUBSTANCES, IS THERE REALLY MUCH DIFFERENCE?

A. No, the main objective is to get rid of that free-phase product. This would be a source control measure which normally leads to clean up through natural attenuation.

Q. CAN YOU TELL ME WHAT INVOLVEMENT YOU HAVE HAD ON THE HAMPTON 4M SITE?

A. I believe it was December of 1996 when I first became aware of this site. One of the technicians called me up and informed me that while he had been performing vertical-extent drilling in the center of our former dehydrator pit at the Hampton 4M, he observed what he thought to be product on top of the water table. Vertical-extent drilling is performed to try and determine the extent of contamination downward within the soil column or vadose zone. This helps to determine if there is any risk of the contamination making it to groundwater. I was surprised that product was on top of the water table. Later in December we verified the presence of product, using the clear disposable bailer, there was a lot of free product. This well has been labeled as monitor well MW-2. We came back to the site in January 1997 and gauged the well with an interphase probe to determine the amount of free product. There was 4.7 feet of free product. We were very surprised and concerned because this was not normal and we had not observed this at any other site.

Q. HOW MANY TIMES HAVE YOU BEEN TO THE HAMPTON 4M SITE?

A. I have been to the site at least 25 to 30 times. I have performed quarterly monitoring there five or six times. Whenever there was some type of major site activity, I tried to be present.

Q. WHAT TYPES OF THINGS HAVE YOU BEEN DOING AT THIS SITE?

A. I have performed a number of functions at this site. I have performed hand augurings of the soil along the wash, installed most of the wells that are at the site and gauged all of the wells. I installed and maintained the product recovery system in MW-6. I have also looked over all of the production equipment at the site to try and determine how it operates and possible sources of the free product.

Q. LOOKING AT PNM EXHIBIT 4, CAN YOU DESCRIBE THE GENERAL LAYOUT OF THE HAMPTON 4M SITE IN TERMS OF THE LOCATION OF THE EQUIPMENT AT THE SITE PRIOR TO 1998?

A. The original equipment was set up for a dual completion well as shown in PNM Exhibit 4. The formations being produced were the Mesa Verde and Dakota. This meant that there was two of each type of equipment. There were two separators, two condensate tanks, two dehydrators and two meter houses. Burlington's equipment (separators, condensate tanks, and well head) were on the south side of the well pad as shown in PNM Exhibit 46 and PNM's equipment (dehydrators and meter houses) were on the north side of the well pad as shown in PNM Exhibit 47. PNM's dehydrator pit was located on the northern edge of the well pad. Burlington had a small pit for water removal from the tank batteries just northeast of the 300 bbl. tank. The past history of this pit is unknown to me. The

pit inside of the impoundment had a very small 500 gallon above ground, below grade stock tank.

Q. DID YOU EVER OBSERVE ANY LEAKS OR RELEASES AT THE HAMPTON 4M WELL SITE?

A. Yes. Burlington's 300 bbl. condensate tank located on the southeast portion of the well pad had a slow-dripping, leaking valve in the area of the former impoundment. The tank was also very small and did not appear to be adequate for the fluids.

On the southernmost side of the well pad in the area of Burlington's production separator pit, there was a fiberglass tank above ground, but below grade. There was visual evidence of contaminated soil, at least on the soil surface, from when the separator blew down the fluids. The force of the blow down would spray the fluids out of the tank onto the soil impoundment.

Contamination was visible and I recall we had a meeting on site shortly after discovering the contamination. Denny Foust from the OCD, Craig Bock from Burlington and I were present. Mr. Foust criticized Burlington about this situation. I believe that there was a letter written in April of 1997 by the OCD to Burlington because of this incident. The OCD asked Burlington to address the cause and extent of groundwater impacts related to the tank drain pit and production pit located on the Southeast corner of the well pad.

PNM Ex 21

as per testimony 8/26/99

Q. WERE YOU PRESENT WHEN BURLINGTON WAS PERFORMING THE EXCAVATION IN THE SOUTHEAST PORTION OF THE WELL PAD IN

THE AREA OF IT'S 300 BBL MESA VERDE TANK AS DEPICTED ON EXHIBIT 4 ?

A. Yes, I was present. In December 1997, I observed as a bulldozer cut through the sandstone on the southeast corner of the well pad. Early reports from a preliminary investigation performed by Burlington indicated that they had not detected visible soil contamination in this area. However, the investigation was conducted at a very shallow depth above the sandstone layer at this location. I observed hydrocarbon contamination visually, and I also observed as Philip, Burlington's contractor, took PID readings of the contamination in the sandstone at approximately 12 feet below surface. Again, Denny Foust with the OCD was present and also observed this.

Q. DID THIS EXCAVATION REMAIN OPEN FOR A PERIOD OF TIME?

A. Yes, it remained open approximately one year, plus or minus.

Q. DID YOU SEE ANY CONTAMINATION IN THIS EXCAVATION?

A. Yes, I saw hydrocarbon contamination. Occasionally at this site, which I visit frequently, I have observed a sheen or rainbow moving across the water in the northeast corner of the excavation. In July 1998 I collected a sample from the soil in the northeast corner of the excavation just above the water level and the results were above the OCD guidelines for pit closure. The results were 36 ppm for benzene and 2126 ppm for total BTEX as listed in PNM Exhibit 48. The closure guidelines require benzene to be below 10 ppm and total BTEX to be below 50 ppm.

Q. WHAT DOES RAINBOWING SUGGEST WITH REGARD TO WHETHER THERE IS A CONTINUING SOURCE?

A. It suggests that there is still some type petroleum contamination at this site.

Q. DURING THE TIMES YOU HAVE BEEN OUT TO THE SITE, HAS THERE ALWAYS BEEN WATER IN THE BOTTOM OF BURLINGTON'S INITIAL EXCAVATION?

A. Yes.

Q. WHAT IS YOUR OPINION AS TO WHETHER THAT EXCAVATION HAS REACHED THE GROUND WATER?

A. Every time that I have been to the site, there has always been water in the excavation. This suggests that this excavation reached the ground water table. The water table fluctuates. When the water level rises and falls through the soil at the vadose zone, the petroleum disperses into the water causing this rainbow or sheen.

Q. HAVE THE SAMPLES OF THE WATER THAT IS IN BURLINGTON'S INITIAL EXCAVATION REMAINED ABOVE STANDARDS?

A. I have sampled the water on three different occasions during quarterly sampling. The first two water samples provided results above WQCC standards. However, tests in the fall of 1998 indicate that the dissolved-phase contamination was below standards.

Q. DOES THIS SUGGEST THAT BURLINGTON IS CLEANING UP THIS SITE?

A. No. The excavation was open and exposed to the atmosphere. The hydrocarbon contamination will aerate and volatilize. There is also some degradation from UV sunlight and through natural attenuation. The water is also stagnant. If you were to purge the stagnant water and collect some of the recharge water, the results would likely be quite different and would reflect the contamination in the soil. A more representative sample should be collected from a monitor well if it were available. It is not surprising the standing water could be below standards.

Q. IN YOUR OPINION, IS THIS INITIAL BURLINGTON EXCAVATION , A COMPLETE REMEDIATION AT THIS PORTION OF THE SITE?

A. No. There is still free product and soil contamination on the south side of the well pad. The thing that concerned me is that the excavation area, especially at the saturated zone, was quite small. The excavation never went far enough to the north where Burlington's tank pit was. The excavation also did not extend far enough to the south to address contamination documented by Burlington's earlier soil borings at TPW-5 and 6. The excavation only addressed a very limited area in the vicinity of TPW-07. Without more data, such as permanent wells, it is very hard to accurately characterize the groundwater in this area. Permanent monitor wells sampled over time would give a better indication of the magnitude of the contamination. The sudden appearance of free product in monitor well MW-4 confirms that free product exists in this area as indicated by the high dissolved phase concentrations in TPW-5 and TPW-7. Until you get the free product out of

there and off of the water table or figure out it's source, remediating soil or anything downgradient makes absolutely no sense.

Q. LOOKING AT THE LOCATION OF BURLINGTON'S OPERATIONS, IN YOUR OPINION, WHERE ARE THE POTENTIAL SOURCES OF CONTAMINATION?

A. I believe the contamination is coming from the former tank battery area, or it could be coming from the wellhead or surface activities related to discharges from the well head.

Q. LOOKING AT PNM EXHIBIT 49, WHAT IS YOUR UNDERSTANDING OF WHERE THIS DIAGRAM CAME FROM?

A. It was provided by Burlington in response to a letter request for information. The diagram shows where all of the dehydrators, meter houses, separator units, and pits were originally located. It also shows the location of the original equipment and impoundments at the site prior to the removal of the tank batteries and the dehydrators. There is also an apparent unlined pit in the actual southern part of the diagram which appears toward the upper left hand corner of the diagram. This pit is a potential source for contamination.

Q. WAS THERE WAS SOME TESTING DONE AT TPW-5 AND 6, IN THE VERY SOUTHEAST PORTION IN THE VICINITY OF WHERE THE PIT IS SHOWN ON PNM EXHIBIT 49?

A. Yes there was. The testing showed all the BTEX compounds were very, very high. The water in TPW-5 was basically saturated with hydrocarbon. TPW-5 and TPW-6 are shown in PNM Exhibit 6.

Q. IS THAT CONSISTENT WITH THERE HAVING BEEN AN UNLINED PIT IN THAT AREA?

A. Yes it is.

Q. AS I UNDERSTAND IT, YOU WERE ON SITE FOR PART OF THE TIME WHEN BURLINGTON PERFORMED ITS REMEDIATION ACTIVITES IN LATE 1998 AND EARLY 1999. CAN YOU TELL US WHAT YOU OBSERVED WITH REGARD TO BURLINGTON'S REMEDIATION ACTIVITIES ON THE SITE?

A. In November 1998, Ed Hasely notified me that Burlington was going to come in with a bulldozer and excavate in the area of our former pit location. They were going to just blade it away. Burlington, through its contractor Philips, brought in a bulldozer and basically moved northwesterly across the site just cutting and pushing the soil out of the way, right on top of where MW-6, our product recovery system, and MW-2, were.

Q. DID YOU HAVE AN OPPORTUNITY TO OBSERVE WHAT TYPE OF MARKING OR LANDMARKING PROCEDURES THEY WERE USING?

A. Yes. We lost our landmarks early on when Burlington removed them without providing alternate markers. The Williams above-ground lined tank, the dehydrator, and the meter house were all removed. The lines between the

dehydrators and the separators were removed. The only marker we had was the cathodic protection next to MW-9. During the course of this work, Philip was trying to take elevations. I would say they were within plus or minus one or two feet, with regard to the accuracy of the level being measured in the bottom of the excavation. Horizontally or laterally it was also hard to determine the source of soil with respect to the previous locations of the surface equipment.

Q. WAS THE BOTTOM OF PNM's FORMER DEHYDRATION PIT LOCATED DURING THE COURSE OF BURLINGTON'S MOST RECENT EXCAVATION?

A. Yes. We found what I believe was the bottom of our former pit at approximately 13 to 14 feet.

Q. WHY DO YOU SAY THAT IT WAS THE BOTTOM OF PNM'S FORMER PIT?

A. Because there was a black band of contaminated soil about one to two feet thick that was slightly waxy or paraffinic. This is a good indication of where the bottom of the pit was. Visually, this band is quite easy to distinguish from the natural color of the soil. PNM Exhibit 50 shows the excavated bottom of the pit. It is the black soil shown in the foreground of the photograph.

Q. DID THE SOILS BELOW WHAT YOU BELIEVE WAS THE PIT BOTTOM APPEAR SATURATED?

A. No, they did not.

Q. IS SATURATED SOIL SOMETHING THAT YOU WOULD ORDINARILY SEE IF THE SOURCE FOR THE FREE PRODUCT WAS COMING FROM ABOVE THAT POINT?

A. Yes.

Q. WHAT DID YOU OBSERVE IN THE SOILS UNDERNEATH THE BOTTOM OF THE PIT?

A. Since a dozer was being used to excavate the soil, it was very hard to differentiate clean soils from contaminated soils. A large percentage of clean soils were mixed with the contaminated soils and they could not easily be segregated. I would say that concentrations from readings taken with a PID were in the order of magnitude from 700 parts per million to 1500 parts per million, at the 14 foot level.

Q. CAN YOU DESCRIBE WHAT THE SOIL LOOKED LIKE BELOW THE BOTTOM OF THE PIT?

A. There was hard layer of sandstone at about sixteen feet below the ground surface. The soil appeared to be contaminated, but it was definitely not saturated. PNM Exhibit 51 shows the bulldozer attempting to rip through the sandstone.

Q. IS A PID A RELIABLE INDICATOR OF LEVELS IN THE SOIL?

A. I wouldn't say it is accurate quantitatively. It is just a tool that gives you a guide. A more reliable representation of the concentrations would have been a laboratory analysis.

Q. WOULD A BETTER INDICATOR OF THE LEVELS OF CONTAMINATION BE THE SOIL BORINGS THAT HAVE BEEN DONE IN THAT AREA?

A. Yes. It was much easier to accurately determine the exact depth at which the sample was collected. It also allowed discrete samples to be taken. One sample was also taken for laboratory analysis. The results of the soil borings in PNM's former pit are included in PNM Exhibit 15.

Q. DID BURLINGTON EVER STRIKE WATER WHERE IT WAS PERFORMING ITS LATEST EXCAVATION?

A. When Burlington reached a level it had noted as 27 feet it reached free product on top of the water.

Q. WHERE WAS THE WATER COMING FROM?

A. It was bubbling up from the area where MW-6 was. This indicates that there was upward pressure behind the ground water.

Q. DID YOU OBSERVE PRODUCT IN THAT WATER?

A. Yes, on top of it.

Q. WERE THERE ANY SAFETY CONCERNS THAT AROSE BECAUSE OF THE VAPORS THAT WERE IN THE AREA?

A. Definitely. The hydrocarbon concentrations in the atmosphere were very, very high and the dozer operator said that he was getting dizzy. We used a personal monitor to detect unsafe levels of benzene and within thirty minutes of being down in the hole, the concentrations were about seven times higher than the

permissible exposure level or time-weighted average under OSHA or NIOSH guidelines.

Q. DID YOU EVER OBSERVE OPERATIONS BEING CURTAILED BECAUSE OF THE HEALTH OR SAFETY ISSUES?

A. I believe that on the third day of excavation, the hydrocarbon concentrations were so bad that Burlington ceased activities for that day.

Q. WAS THERE EVER ACHANGE OF PERSONNEL AT THE SITE DUE TO A LACK OF SAFETY TRAINING?

A. Yes. Ed Hasley shut down the site and called out his site health and safety supervisor to determine what to do. Burlington decided that they would have a health and safety meeting and also determined that they needed an operator that was 40-hour health and safety trained.

Q. WHAT IS THIS 40-HOUR HEALTH AND SAFETY TRAINING?

A. It is OSHA training that provides a basic overview of awareness of the hazards that are out in the field.

Q. WAS THAT TRAINING SOMETHING THAT THE OPERATORS SHOULD HAVE HAD BEFORE THEY STARTED WORKING OUT THERE?

A. Yes.

Q. IN YOUR EXPERIENCE, ARE THE FINDINGS AT THE HAMPTON 4M SITE UNUSUAL WITH RESPECT TO THE PRESENCE OF FREE PRODUCT

A. Very unusual. We do not encounter free product at sites with just dehydration.

Q. IF THERE IS A CONTINUING SOURCE UPGRADIENT OF PNM'S FORMER PIT, IS BURLINGTON'S REMEDIATION IN PNM's FORMER PIT AREA GOING TO BE EFFECTIVE?

A. No. You need to attack the contamination at the source. Burlington needs to address and investigate the contamination on the portions of the well pad underlying its present and former pits and equipment. There has never been a thorough investigation to determine the magnitude or the source of the contamination. Temporary monitor wells that are removed do not provide ongoing data to determine whether or not the contamination has been remediated.

Q. HAVE YOU OBSERVED ANY RECENT ACTIVITIES THAT WOULD LEAD YOU TO BELIEVE THAT THERE IS STILL FREE PRODUCT UPGRADIENT OF PNM'S FORMER PIT?

A. Yes, PNM Exhibit 52 shows a picture of the excavated area southeast of PNM's former pit. The photograph shows the presence of free product accumulating along the eastern wall of the excavation far above and to the east of our former pit. PNM Exhibit 53 also depicts a picture of the product as it is accumulating on the eastern edge.

Q. IN YOUR OPINION, WOULD BURLINGTON'S REMEDIATION EFFORTS BE MORE EFFECTIVE ON ITS OWN PORTION OF THE WELL PAD?

A. Yes, they would.

Q. JUST BECAUSE THERE IS FREE PRODUCT UNDER PNM'S FORMER PIT, DOES THAT MEAN THAT FREE PRODUCT ORIGINATED FROM PNM'S PIT?

A. No. Essentially when we are recovering product we are making a path, pulling it in; we are giving it a conduit. Also, the nature of the well pad, the slope, geology, and the hydraulic gradient all contribute to the fact that water and product flow down hill and PNM's former pit is on the low end of the hill. The reason we put the recovery system there is because that was the location of the highest known volume of free product.**Q. WHAT EFFECT DOES A RECOVERY WELL, SUCH AS MW-6, HAVE ON FREE PRODUCT CONTAMINION IN THE GROUND WATER?**

A. In very simple terms, it acts as a big straw which draws in free product from other areas. The process occurs somewhat slowly, but it does draw contamination in from other areas. Because PNM's product recovery system was in the area of its former pit, this would tend to concentrate the free product under the pit.

Q. TO YOUR KNOWLEDGE HAS ALL OF THE FREE PRODUCT BEEN REMOVED FROM THE AREA OF BURLINGTON'S MOST RECENT EXCAVATION?

A. No. I believe that some of the product was pumped out (approximately one bbl.) and removed as the water and free product accumulated. However, to my knowledge the seepage of product into the excavation never ceased completely. PNM Exhibit 54 taken in early December of 1998 shows the excavation being

backfilled with clean soil while the water in the excavation still contained free product.

Q. WOULD THAT CAUSE FUTURE GROUNDWATER PROBLEMS DOWNGRADIENT?

A. Yes, it would. The free product is still there. That will cause continuing dissolved phase contamination.

Q. WERE YOU PRESENT FOR THE ENTIRE DURATION OF BURLINGTON's REMEDIATION EFFORTS?

A. No. I was only present during the first week of remediation. I stopped by the site on another occasion, but I did not observe any of the remediation efforts on the southern edge of the well pad. I have reviewed the report for the work performed by Philip dated March 3, 1999, and it is very unclear as to the extent, depth and success of the soil remediation efforts on the southern edge of the well pad.

Q. WHAT IS THE CURRENT STATUS OF THE HAMPTON 4M WELL SITE?

A. The well is currently producing. Williams equipment (dehydrator, tank and meter house) has been moved just north of the well head. There remains a large hole on the northeastern edge of the well pad where the excavation was never backfilled. PNM Exhibit 55 taken in February of 1999 shows the present well pad configuration.

Q. IS PNM CONTINUING TO SAMPLE THE REMAINING AND NEWLY INSTALLED MONITORING WELLS AT THE HAMPTON 4M SITE?

A. Yes. We will supplement our testimony in this proceeding as additional sampling results are gathered.

Q. HAVE THE OPINIONS YOU HAVE GIVEN IN YOUR TESTIMONY ABOUT THE LOCATION AND SOURCE OF CONTAMINATION AND ADEQUACY OF THE REMEDIATION AT THIS SITE BEEN BASED UPON YOUR EDUCATION, TRAINING AND EXPERIENCE IN THE AREA OF HYDROCARBON REMEDIATION?

A. Yes they have.

Q. AND ARE YOUR OPINIONS BASED ON A REASONABLE SCIENTIFIC CERTAINTY?

A. Yes they are.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes it does.

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION COMMISSION

IN THE MATTER OF THE HEARING CALLED
BY THE OIL CONSERVATION COMMISSION
FOR THE PURPOSE OF CONSIDERING:

APPLICATION OF PUBLIC SERVICE COMPANY OF NEW MEXICO FOR *DE NOVO* HEARING ON ORDER NO. R-11134 ISSUED BY THE NEW MEXICO OIL CONSERVATION DIVISION IN

CASE NO. 12,033

AFFIDAVIT

STATE OF NEW MEXICO)
)SS.
COUNTY OF BERNALILLO)

I, Mark Sikelianos, upon being first duly sworn according to law, under oath, depose and state: That I am Senior Technician in the Environmental Department for Public Service Company of New Mexico, and that I have read the foregoing Direct Testimony, including exhibits. I further affirmatively state that I know the contents thereof and that they are true and correct to the best of my knowledge and belief.

SIGNED this 9th day of July, 1999.

MARK SIKELIANOS

SUBSCRIBED AND SWORN to before me this 9th day of July, 1999.

(Seal, if any)

Notary Public

[My Commission Expires:]

DAM0259

BEFORE THE

NEW MEXICO ENERGY, MINERALS AND NATURAL RESOURCES

OIL CONSERVATION COMMISSION

**IN THE MATTER OF THE APPLICATION OF
PUBLIC SERVICE COMPANY OF NEW MEXICO
FOR REVIEW OF OIL CONSERVATION DIVISION
DIRECTIVE DATED MARCH 13, 1998
DIRECTING APPLICANT TO PERFORM
ADDITIONAL REMEDIATION FOR
HYDROCARBON CONTAMINATION,
SAN JUAN BASIN, NEW MEXICO CASE NO. 12033**

DIRECT TESTIMONY OF

VALDA I. TERAUDS

SUBMITTED ON BEHALF OF

PUBLIC SERVICE COMPANY OF NEW MEXICO

APPLICANT

JULY 9, 1999

Q. CAN YOU PLEASE STATE YOUR NAME AND YOUR PLACE OF EMPLOYMENT?

A. My name is Valda I. Terauds and I am employed by Mission Research Corporation ("MRC") in Albuquerque, New Mexico.

Q. WHAT IS YOUR CURRENT POSITION WITH MRC AND WHAT ARE YOUR JOB DUTIES IN THAT POSITION?

A. I am a Senior Scientist - Hydrologist. My job duties include managing projects to investigate and remediate contaminated sites under a variety of federal and state programs, expanding environmental business through marketing and proposals, and providing senior level expertise for projects requiring technical review and expert testimony.

Q. CAN YOU TELL US ABOUT YOUR EDUCATIONAL BACKGROUND, STARTING WITH COLLEGE?

A. I received a bachelor of science degree in biochemistry from Catholic University in 1982. In 1985, I received a master of science degree in hydrology from the New Mexico Institute of Mining and Technology.

Q. CAN YOU TELL THE COMMISSION ABOUT YOUR EXPERIENCE WITH RESPECT TO ENVIRONMENTAL INVESTIGATION AND REMEDIATION?

A. I am presently working for EPA Region 6 as a contractor for the Highway 71/72 Refinery CERCLA site in Bossier City, Louisiana. The focus at this site is the characterization and remediation of free phase hydrocarbons, the remediation of

benzene and other volatile organics in indoor air, and the remediation of lead and other hydrocarbons in surficial soils. I provide technical assistance to other projects under RCRA and state programs, as needed.

I was a staff-augmentation contractor to PNM over a three-year period (1996 to 1998), where work responsibilities included evaluating contaminant behavior and distribution in soil and groundwater for the Hampton 4M Site. In addition, I assisted with groundwater remediation projects at the Santa Fe Generating Station and Person Generating Station sites. I maintain a consulting relationship with PNM on an as needed basis, including support for this hearing. In 1998, I worked as a hydrologist for Environmental Sciences, Inc. I owned and managed my own environmental consulting business, Enhanced Solutions, for a two-year period from 1996 to 1997.

Prior to that time I was employed by Geoscience Consultants (1990 – 1996), Jacobs Engineering Group (1987-1990), and Woodward-Clyde Consultants (1986-1987).

The focus of my work has involved soil and groundwater contamination assessment, contaminant fate and transport analysis, soil and groundwater remediation, free product recovery, and natural attenuation. Roughly 80 percent of the more than 170 sites that I have worked on have dealt with groundwater contamination. My prior experience in the San Juan basin of New Mexico includes site characterization and remediation work at the Bloomfield Refinery

Site, underground storage tank sites in Farmington and Aztec, and the groundwater sites identified under the PNM Gas Assets Remediation Program.

I have provided depositions in several cases, including AT&SF versus multiple insurance companies regarding free phase and dissolved phase hydrocarbons at the Belen Main Line Fueling facility in Belen, New Mexico; on behalf of Texaco, Inc. at the TuTu CERCLA Site in St. Thomas, Virgin Islands regarding hydrocarbon and chlorinated solvent fate and transport; and prior to that, for Cotton Butane versus Ranger Insurance concerning an underground storage tank release in Tatum, New Mexico. In addition, I was qualified as an expert in the field of groundwater contamination and remediation in the testimony I rendered before the OCD hearing examiner in this case.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to provide expert testimony to support PNM's position that: (1) PNM's former unlined pit is not the source of free phase hydrocarbons in groundwater at the site; (2) the free phase product underlying the Hampton 4M well pad originated at a release point or points upgradient of PNM's former unlined pit; (3) PNM has already recovered more free product from the groundwater than could possibly have been discharged into its former unlined pit under any conceivable scenario; and (4) Burlington's remedial efforts have not been successful in removing the upgradient sources of free product.

Q. WHAT WILL BE THE FOCUS OF YOUR TESTIMONY?

A. My testimony will focus on the contributions of hydrocarbon contamination to the subsurface, the fate and migration of the hydrocarbon materials, the effectiveness of remediation techniques, and the apportionment of responsibility for resulting contamination.

Q. WHAT WAS YOUR FIRST INVOLVEMENT WITH THE HAMPTON 4M SITE?

A. Once groundwater contamination was identified, I became aware that the Hampton 4M Site was a groundwater contamination site within the PNM pit program, but I was not actively involved with this site until the hydrocarbon seep was discovered by Burlington and identified to the OCD in April of 1997. The presence of free phase hydrocarbon and the hydrocarbon seep raised a concern about migration of groundwater contamination.

Q. WHAT WERE YOUR RESPONSIBILITIES CONCERNING THE HAMPTON 4M SITE?

A. I have been involved with site data analysis, evaluation of the groundwater flow regime, evaluating the distribution of soil, free product, and dissolved phase contamination in the subsurface, evaluation of free product recovery operations, and cursory evaluation of Hampton 4M well production history. Specific records reviewed included data generated by PNM during the course of investigation work such as: soil boring logs, monitoring well installation records, soil and groundwater testing results, photographs, and video. I have also visited the site at least three times and have prepared many of the diagrams regarding groundwater

flow and contaminant distribution used by both PNM and Burlington in reporting to NMOCD. I have also provided technical review of reports and correspondence prepared by Burlington and submitted to NMOCD and PNM. I also prepared many of the exhibits presented at the OCD hearing in November 1998 and included with the present testimony submitted on behalf of PNM.

Q. **WHAT IS YOUR UNDERSTANDING OF THE OCCURRENCE OF FREE PHASE HYDROCARBONS BENEATH THE FORMER PNM UNLINED PIT?**

A. Free phase hydrocarbons occur on top of the water table beneath the former PNM unlined pit as well as in areas significant distances upgradient from the pit. However, there is no evidence of any free phase hydrocarbon residual between the base of PNM's former unlined pit and the water table. This shows that the former PNM dehydration pit is not the source of free phase hydrocarbons underlying the well pad. Examination of excavation records and soil boring logs for activities performed both by PNM and Burlington in the area of the former PNM unlined pit demonstrate that free phase hydrocarbons were not present in the former pit, nor were they present in the soil column beneath the base of the pit to the capillary fringe of the water table. It was only upon reaching the capillary fringe in the soils and water table that soil saturated with free phase hydrocarbons was encountered. This lack of a continuous, highly contaminated hydrocarbon zone from the base of PNM's former unlined pit to the water table is direct field evidence that PNMs former unlined pit is not the source of free phase

hydrocarbons floating on the water table. PNM Exhibit 15 includes boring logs for MW-2, MW-6, SB-2, and MW-12, to substantiate that there is no hydrocarbon-saturated soil present beneath in the soils beneath the base of the former PNM pit extending to groundwater. Hydrocarbon-saturated soils are encountered only in the immediate vicinity of groundwater. On Burlington's excavation of this area, an active free product seep was discovered upgradient and to the southeast of PNM's former pit, as shown on PNM Exhibit 6. This clearly demonstrates that ongoing hydrocarbon contamination is coming from locations upgradient and at locations remote from PNM's former pit. This is further corroborated in a videotape and photographs of Burlington's remediation efforts introduced by PNM Witness Sikelianos.

Q. AT WHAT DEPTH BENEATH PNM'S FORMER PIT WERE FREE PHASE HYDROCARBONS, OR FREE PRODUCT ENCOUNTERED?

A. Free phase hydrocarbons were encountered at depths of over 22 feet in the borings for MW-2 and MW-6 which show that free product is moving along the top of the water table in response to the hydraulic gradient and capillary forces. The free product has migrated to the area beneath PNM's former pit from upgradient sources. This was further corroborated by Burlington's boring SB-2 installed at a location between PNM's MW-2 and MW-6 within the former PNM pit. The reports relating to SB-2 are set forth in PNM Exhibit 15. As shown in the reports, Burlington did not observe free product and highly stained soils until the water table was encountered. In fact, under NMOCD guidelines, PNM could

have clean closed their pit based on PID data presented in PNM Exhibit 15 relating to SB-2.

Q. WHAT IS YOUR UNDERSTANDING OF SUBSURFACE CONDITIONS BENEATH PNM'S FORMER PIT PRIOR TO REMEDIATION?

A. PNM performed a vertical extent assessment by the installation of a soil boring later converted to monitoring well MW-2. This boring is documented in PNM Exhibit 15. The boring log indicates that silty fill sands were encountered in the upper 11 feet, with a dark brown streak of silty to clayey sands and hydrocarbon odor encountered at 12 feet. This presumably represented the base of PNM's former pit. Additional drilling showed progressively stronger hydrocarbon odors, but soil color did not change until the water table was encountered. Soil color changed from brown to light gray to green gray. Soil color can be a visual indicator of relative degree of hydrocarbon contamination. Hydrocarbon-saturated soils would be expected to change color to a gray to black stained soil. Soils beneath the base of PNM's pit and the water table were recorded as primarily brown colored sands which is inconsistent with hydrocarbon-saturated soil. About 2 inches of free product was detected in a sample bailed from MW-2. Depth to groundwater at the time of drilling was 27.8 feet from ground surface, and later rose to 21.58 feet at the time of well completion.

Q. DID PNM PERFORM ADDITIONAL BORINGS IN THE AREA OF ITS FORMER PIT?

A. Yes, PNM installed a free product recovery well, MW-6, and later MW-12, the replacement well for both MW-2 and MW-6, which was installed after Burlington's massive excavation work.

Q. WERE THESE BORINGS CONSISTENT WITH PRIOR FINDINGS BENEATH PNM's PIT?

A. Yes. PNM free product recovery well boring MW-6, as shown in PNM Exhibit 15, depicts fill to approximately 11 feet, changing to a weathered sandstone, sand brown-red in color. At approximately 20 feet, a color change occurs and you have a light brown, grading to gray colored sandstone or sand. The boring is noted as saturated with hydrocarbons at a depth of 24 feet. The interval between the base of PNM's pit (11 feet), and the depth at which free product is encountered (24 feet) is again noted as light brown, with no indications of hydrocarbon-saturated soil until the free product is encountered. The boring for MW-12 was sampled at a depth interval of approximately 24 feet. Benzene concentrations were 1.2 ppm, less than the 10 ppm NMOCD requires for closure.

Q. DID BURLINGTON PERFORM ANY ACTIVITIES TO SAMPLE THE SUBSURFACE BENEATH PNM's FORMER PIT?

A. Yes, Burlington installed soil boring SB-2, which is included in PNM Exhibit 15, prior to performing their excavation activities in the area of PNM's pit. Boring SB-2 again indicated a relatively clean vadose zone between the base of PNM's pit and the water table. A sample obtained from the 15-foot interval in SB-2 also

showed benzene concentrations at 1.95 ppm, less than the 10 ppm NMOCD requires for closure.

Q. DO YOU HAVE ANALYTICAL LABORATORY DATA THAT DEMONSTRATE SOILS BENEATH PNM'S FORMER PIT ARE RELATIVELY CLEAN BENEATH THE BASE OF THE PIT AND GROUNDWATER?

A. Yes, as shown on PNM Exhibits 56 and 48, a number of samples have been obtained by both PNM and Burlington in the vicinity of the former PNM pit. PNM Exhibit 48 is a table showing all of the analytical laboratory sampling results for the site. Exhibit 48 shows trends in concentration with time. Exhibit 56 is a cross-section of the area of PNM's former pit and the soils underlying the pit to the groundwater. This is also the area excavated by Burlington in late 1998. As shown on PNM Exhibit 56, the size of PNM's former pit is fairly small relative to the area excavated. This is shown to scale on PNM Exhibit 4, where the footprint of the former PNM pit represents less than one percent of the square footage of the well pad. The PNM pit and pit base are shown in the top center of the illustration in PNM Exhibit 56, with a PNM sample obtained at the base of the pit in April 1996 showing benzene, BTEX, and total petroleum hydrocarbon concentrations above NMOCD guidelines. Burlington boring SB-2 was sampled at approximately 15 feet – three feet below the base of PNM's pit, and demonstrated that benzene, BTEX, and TPH concentrations were below NMOCD closure guidelines. Therefore, PNM could have submitted for clean closure based

on the results reported for boring SB-2. As shown in PNM Exhibit 56, it is not until the water table, that contamination is encountered in the form of free phase hydrocarbons and soil concentrations again exceed closure guidelines. These samples clearly show that PNM was not the source of free phase hydrocarbons at this site.

Q. WHAT IS THE SIGNIFICANCE OF THESE FINDINGS?

A. This is clear evidence of an eight to ten-foot thick column of relatively clean soil between the base of PNM's former pit and the water table. This again demonstrates that free product has migrated to locations beneath PNM's former pit, not as discharge vertically through the vadose zone, but as a result of product migrating from upgradient locations along the water table. Examination of site hydrogeology in the cross-section shown in PNM Exhibit 62 reveals the presence of a progressively thickening sand zone originating upgradient of PNM's former unlined pit and in the vicinity of the Burlington's operations. This sand zone increases in thickness downgradient in the direction of PNM's former unlined pit. Free phase hydrocarbons in the subsurface will move preferentially in the coarsest layers encountered. At the Hampton 4M site, this layer was the sand layer. Unfortunately for PNM, the thickest zone of sand, and hence free phase hydrocarbon accumulation, occurred beneath PNM's former unlined pit. Monitoring wells installed and/or sampled subsequent to OCD's "line in the sand" north of MW-10 indicated the presence of free phase hydrocarbons in at least three upgradient wells, revealing that the true source of free phase hydrocarbons

lies upgradient of PNM's former unlined pit, in the vicinity of equipment, former tank batteries, and other handling and storage equipment managed and operated by Burlington.

Q. DID PNM NOTIFY THE OCD OF THESE FINDINGS?

A. Yes. PNM notified OCD of the presence of significant upgradient sources of free phase hydrocarbons and continued to update OCD as additional free product was discovered in upgradient monitoring wells. PNM indicated to OCD that any free phase hydrocarbon remediation efforts undertaken by PNM in the vicinity of the PNM former pit would be ineffective until the real and ongoing sources of free phase hydrocarbons were identified, curtailed, and remediated.

Q. WAS THE OCD'S DIRECTIVE REQUIRING PNM TO UNDERTAKE REMEDIATION OF THE DISSOLVED PHASE PRODUCT UNDER THE HAMPTON 4M WELL SITE A SOUND APPOACH IN ADDRESSING THIS CONTAMINATION PROBLEM AT THE SITE?

A. No. Undertaking dissolved phase groundwater remediation in the absence of removing the free phase hydrocarbons causing dissolved-phase contamination is not technically rational, nor is it a cost-effective expenditure of limited remediation dollars. Unless the free phase is removed first, there will be a continuing problem with dissolved phase contamination at this site.

Q. ADDRESSING PNM ISSUE #1, IN YOUR OPINION, DID PNM CONTRIBUTE FREE PHASE HYDROCARBONS TO GROUNDWATER?

A. No. There is no field evidence that shows a discharge of free phase hydrocarbons from the base of PNM's pit to the water table. Free phase hydrocarbons, also referred to as free product, are encountered only upon reaching the water table, suggesting other upgradient sources are responsible. The amount of free phase potentially released via PNM's former dehydrator and into the unlined pit would not typically be discharged from the dehydrator in the form of free phase hydrocarbons. The typical discharge would be dissolved phase. Where an upset condition might have occurred in Burlington's upstream equipment, the volume of free phase hydrocarbons discharged through PNM's equipment would not be sufficient to exceed the absorption capacity of the underlying soil column and reach groundwater as a separate and free-floating hydrocarbon layer.

Q. **ADDRESSING PNM ISSUE #2, WHAT IS YOUR UNDERSTANDING OF THE OCCURRENCE OF FREE PRODUCT BENEATH THE WELL PAD?**

A. Free product is distributed across most of the well pad area, as shown on PNM Exhibit 57. This free product plume included wells MW-2, -4, -6, -8, and –10, as well as temporary boring TPW-2. Wells with free product located progressively upgradient from PNM's former pit include TPW-2, MW-10, MW-8, and MW-4 – all located either in the vicinity of or immediately downgradient of Burlington's operations and former tank batteries.

Q. **WHAT IS YOUR UNDERSTANDING OF THE RELATIVE AMOUNTS OF PRODUCT HANDLED AT THE SITE BY BURLINGTON AND BY PNM?**

A. Burlington managed all of the hydrocarbon fluids produced from the Hampton 4M wellhead. Burlington had 22,000 gallons of liquid storage capacity for free phase liquid hydrocarbons at this Site compared to 2,000 gallons of liquid storage capacity for dissolved phase hydrocarbons managed by PNM. Burlington managed and sold free product on the site.

Q. IN YOUR OPINION, HOW LIKELY IS IT THAT BURLINGTON HAD A RELEASE OF FREE PRODUCT FROM ITS OPERATIONS AT THE HAMPTON 4M SITE?

A. The data show that it is highly probable that Burlington released the free phase hydrocarbons at this site. As testified by PNM Witness Sikelianos, Burlington has been cited by OCD for a leaking valve on the 300 barrel above ground storage tank and inadequate tankage at this site. Free product has been detected in three monitoring wells underlying and/or downgradient of Burlington's equipment, and at locations significantly upgradient from PNM's former pit location. These locations include MW-4, MW-8, and MW-10. In addition, two temporary wells installed by Burlington, TPW-5 and TPW-7, showed extremely high dissolved phase concentrations, suggesting that these wells also would have showed free product contamination if they had been left in place for a sufficient period of time to allow product to break through sidewall smears that are typical on drilling and placement of wells.

Q. AS A GENERAL PROPOSITION, HOW RELIABLE ARE TEMPORARY WELLS IN DETECTING GROUNDWATER CONTAMINATION?

A. Temporary wells are not always reliable indicators of the presence of free product as the drilling process disturbs the formation and temporary wells are not developed to try and mitigate the smearing that can prohibit free product entry into the temporary well.

Q. HOW DO YOU RESPOND TO THE BURLINGTON REPORT FOUND AT PNM EXHIBIT 37 SUGGESTING THAT THE GROUNDWATER GRADIENT UNDER PNM'S FORMER PIT IS TOWARDS BURLINGTON'S OPERATIONS?

A. Burlington asserted in a cross section, contained in Attachment 5 to PNM Exhibit 37, that free product is flowing from MW-2 to MW-10. This is incorrect. Burlington's cross-section is merely a non-technical drawing or cartoon that did use field-measured elevations for the top of the well, ground surface, free product elevation, or groundwater elevation. Burlington's cross-section is based on erroneous assumptions and not hard data. PNM has examined the free product elevations between MW-2, MW-6, and MW-10 based on survey data obtained to the nearest 0.01 foot. At no time was the elevation of free product at MW-2 higher than MW-10. The free product in MW-10 is always at least 0.4 feet higher than MW-2, indicating that free product is moving downgradient in a direction consistent with groundwater flow. If anything, PNM accelerated the downgradient migration of product in the immediate vicinity of its former pit by recovering free product from MW-6.

Q. WHAT IS YOUR UNDERSTANDING OF THE OCCURRENCE AND FLOW OF GROUNDWATER AT THIS SITE?

A. Groundwater occurs beneath the Hampton 4M well pad and is hydraulically connected and continuous with groundwater identified by monitoring wells drilled at offsite locations, as shown in PNM Exhibits 61 and 62. Groundwater beneath the site is part of the regional aquifer system, and is not a perched or isolated lens of water. Groundwater elevations were obtained from existing monitoring wells MW-1 through MW-10 by measuring depth to groundwater to the nearest 0.01 foot and subtracting this number from the surveyed top of casing elevation for each monitoring well. Groundwater elevations were mapped to evaluate areas of relatively high and low groundwater elevation. Groundwater flows from high to low elevation. Groundwater flow also follows topographic gradient, flowing from southeast (from the direction of MW-1) to northwest (the direction of MW-7) at a fairly steep hydraulic gradient of 0.1 feet/feet. Groundwater flow direction from MW-7 appears to be northward based on more recent data obtained using MW-11 and the EB well to establish the hydraulic gradient. The hydraulic gradient on the well pad is slightly less steep than that occurring to the northwest, downgradient of the Hampton 4M site, as shown on PNM Exhibit 8 and PNM Exhibit 62 (cross-section).

Q. HOW WOULD YOU CHARACTERIZE THE GRADIENT OF THE GROUNDWATER UNDER THE HAMPTON 4M WELL PAD?

A. At an average value of 0.10 feet/feet; this is a high hydraulic gradient, that combined with hydraulic conductivity estimates, yields an average groundwater flow velocity ranging from 50 feet/year (on the well pad) to 500 (downgradient along the arroyo) feet /year. Both free phase and dissolved phase hydrocarbons are detected in groundwater.

Q. **WHAT IS YOUR UNDERSTANDING OF GROUNDWATER FLOW BETWEEN BURLINGTON'S FACILITIES AND THE FORMER PNM FACILITIES LOCATED ON THE HAMPTON 4M WELL PAD?**

A. As stated previously, groundwater flows from high elevation to low elevation. In this case, MW-1 located in the southeast corner, and off the well pad, is the highest groundwater elevation measured at the site. Burlington equipment and operations, including the Hampton 4M wellhead, are immediately downgradient of MW-1. Monitoring wells MW-4, MW-8, and MW-10 were immediately downgradient of Burlington's equipment and operations. All of these features are located upgradient of PNM's former equipment and former unlined pit. Monitoring well MW-2 and recovery well MW-6 were within the location of PNM's former unlined pit. The northwest corner of the well pad is in a downgradient direction from all facilities on the well pad site. Groundwater flows from offsite in the vicinity of MW-1 proceeding in a northwesterly direction beneath Burlington's operations, beneath the Hampton 4M wellhead, beneath PNM's former equipment, and off the well pad down the arroyo, as shown in cross-section on PNM Exhibit 62.

Q. WHAT ARE THE IMPLICATIONS OF GRADIENT FLOW AS YOU HAVE JUST DESCRIBED?

A. The location of PNM's former equipment and facilities will always receive groundwater and contaminants from upgradient locations because of the hydraulic gradient in this area. Thus, it is impossible to draw an arbitrary fixed line in the sand, apply that line to contaminants that will move with time, and say that the site has been equitably divided as to responsibility for cleaning up mobile contamination. PNM, due to the downgradient location of its former equipment and pit, will always receive inputs from upgradient sources, when present. In this case, a significant source of free phase hydrocarbons is present upgradient in the vicinity of Burlington's operations.

Q. IS THERE ANYTHING ABOUT THE SOILS UNDERLYING THE WELL PAD THAT MIGHT IMPACT THE MIGRATION OF FREE PRODUCT?

A. Yes. Movement of hydrocarbons from Burlington's operations downgradient to areas beneath PNM's former pit is facilitated by the presence of a coarser sand lens that increases in thickness as one moves downgradient. This is an unfortunate geology for PNM, as hydrocarbons move and accumulate in coarser materials, which happen to underlie PNM's former equipment. However, the progressive accumulation of free product in three upgradient wells demonstrates that the source of free product at this site is located upgradient of PNM's equipment. Free product is merely flowing downhill in response to gradient and geology, as does groundwater.

Q. WHAT IS YOUR UNDERSTANDING OF GROUNDWATER FLOW FROM THE HAMPTON 4M WELL PAD TO OFFSITE LOCATIONS?

A. Groundwater flows from the well pad, with some discharge at ground surface occurring at the "hydrocarbon seep" at the northwest corner and base of the well pad. This hydrocarbon seep is believed to be a contact spring that is created because of the sharp decrease in surface elevation from the well pad to the arroyo, as shown on PNM Exhibit 62, a cross-section of the site. In effect, the well pad cut intersects the water table allowing for the seep to discharge water to the surface. This water is currently being collected in a trench, where it infiltrates back into the subsurface and/or evaporates. Groundwater beneath the well pad also flows downgradient along the arroyo to the north. The hydraulic gradient off the well pad is steeper, as is the change in surface topographic gradient, and is greater than 0.10 feet/feet. Groundwater flow velocities are more in the range of 500 feet per year offsite and downgradient of the well pad.

Q. HOW MUCH CONDENSATE OR FREE PRODUCT DID THE HAMPTON 4M WELL PRODUCE?

A. PNM Exhibit 58 provides our estimate of the amount of free product produced and managed at the Hampton 4M site. Production records show that the Hampton 4M wellhead produced 248,000 gallons of liquid hydrocarbons from 1985 to 1997 as shown on PNM Exhibit 44. As noted in the testimony of PNM Witness Rodney Heath, the combined production unit efficiency for liquid/gas separation operated by Burlington would have removed at least 99 percent of liquid

hydrocarbons recovered from the Hampton 4M wellhead. That means that 248,000-plus gallons would have been recovered, stored on site, or sold by Burlington in that time period.

Q. HAVE YOU REVIEWED THE GAS AND OIL PRODUCTION RECORDS REFERRED TO BY PNM WITNESS RODNEY HEATH?

A. Yes. Gas production from both the Dakota and Mesaverde was fairly constant, except for a few anomalies. There is a period during the 1995 time frame where zero oil barrels are reported to OCD. As PNM Witness Heath notes, this raises a question about where this apparent lost production went. Did the formation simply stop producing oil? Was the oil not stored in tanks? Was it blown to the atmosphere or to the ground? This leaves approximately 13,440 gallons unaccounted for in 1995. The absence of oil production for an eighteen-month period with nearly constant gas production is an anomaly that has not been explained by Burlington. The Hampton 4M well averaged approximately 430 barrels of oil per year – the anomaly period is short approximately 320 barrels of oil as compared to this average. A fraction of this product could easily have leaked from Burlington's on-site storage and processing equipment, contaminating the subsurface beneath the well pad. The approximately 13,440 gallons of condensate production unaccounted for in 1995 is similar in volume to the upper estimate of free phase hydrocarbons floating on groundwater beneath the well pad. This may be coincidence, but it merits further investigation by the OCD and Burlington.

Q. WHAT AMOUNT OF PRODUCT DO YOU ESTIMATE HAS PASSED THROUGH BURLINGTON'S EQUIPMENT OVER TO THE DEHYDRATORS FORMERLY OWNED AND OPERATED BY PNM?

A. As summarized in PNM Exhibit 58, the Hampton 4M wellhead production was 248,000 gallons. Assuming the combined production unit was operating at a better than 99 percent separation efficiency, as testified by Mr. Heath, the maximum volume of free phase hydrocarbons passing through to PNM and Williams Field Services equipment, the dehydrator, would be 2480 gallons over a 12-year period. PNM had 2,000 gallons of liquid storage capacity on site designed to handle water with dissolved phase hydrocarbons, the typical byproduct associated with normal operation of the dehydration equipment. This means that Burlington would have stored, handled, and managed over 248,000 gallons of liquid hydrocarbons at this site, not including the approximate 13,000 gallon shortage in the period around 1995. Using the relative percentages of condensate produced from the Dakota (73 percent) and the Mesaverde (27 percent) formations, the API gravities for each condensate, and flashing percentages provided by Mr. Heath, it was assumed that about half of the free phase product would have evaporated prior to discharge into the pit and that between zero to 1126 gallons of free product might have passed through the dehydrator into PNM's former pit from 1985 through 1997. This corresponds to less than 100 gallons per year of free phase hydrocarbons potentially discharging into PNM's former unlined pit.

Q. HOW WOULD THIS DISCHARGE HAVE OCCURRED?

A. As testified by PNM witness Mr. Heath, free product carryover was not common and would occur only if Burlington's equipment were malfunctioning. This free phase hydrocarbon carryover to the dehydrator did not discharge all at once. It would discharge sporadically, in quantities of a quart or two of hydrocarbons over a period of several days over a 12-year duration. Some of the material would flash to the atmosphere, leaving less than 50 percent of the carryover discharging to the former pit. In the event that free phase hydrocarbons were discharged from PNM's former equipment, the volume of free phase hydrocarbons released into PNM's former unlined pit was low and would not exceed the soil absorption capacity of the 12 feet of soil between the base of PNM's former pit and groundwater as shown on PNM Exhibit 56. In addition, soil sorption would trap any free phase hydrocarbons in residual saturation and would not allow the direct migration of free phase hydrocarbons to groundwater. As noted above, the typical discharge from a dehydrator is water containing dissolved hydrocarbons and not free phase hydrocarbons. PNM's only potential contribution to groundwater contamination at this site is in small quantities in the form of dissolved-phase hydrocarbon constituents.

Q. HOW MUCH FREE PRODUCT UNDERLIES THE HAMPTON 4M WELLPAD SITE?

A. The total volume of free phase hydrocarbons residing in the subsurface beneath the Hampton 4M well pad is conservatively estimated at between 7,700 to 13,000

gallons. This is calculated assuming a 15 to 25 percent saturation of hydrocarbons above the water table; free phase hydrocarbon thickness measured in monitoring wells is three times the aquifer thickness; and the internal hydrocarbon plume shape is consistent with the external hydrocarbon plume shape, and maximum free product thicknesses measured over the period of record are considered. The southernmost extent of free phase contamination shown on PNM Exhibit 57 was based on data from MW-4. However, our estimate is highly conservative in that it does not include free product likely present in the subsurface near temporary wells TPW-5 and TPW-7, which underlie Burlington's former equipment. These temporary wells had the highest dissolved phase concentrations measured at the site and, if completed as permanent wells, would likely have shown free product accumulation over time. These large volumes of free phase hydrocarbons would not have passed through PNM's former equipment. As Burlington solely managed the liquid free phase hydrocarbon condensate coming from the wellhead, it is more likely than not that Burlington is the principal source of free phase hydrocarbons beneath the Hampton 4M well site.

Q. HOW DOES YOUR CALCULATON OF THE MAXIMUM AMOUNT OF FREE PRODUCT THAT COULD HAVE REACHED PNM'S FORMER PIT COMPARE TO THE ESTIMATED VOLUME OF FREE PRODUCT ON THE WATER TABLE?

A. The free product in groundwater is 7 to 13 times greater than the maximum volume of free product that could potentially have discharged through PNM's former dehydrator as shown in PNM Exhibit 58.

Q. WITH REGARD TO ISSUE NO. 3, DID PNM INITIATE ANY REMEDIATION ACTIVITIES AT THIS SITE?

A. Yes. PNM responded to indications that there was soil contamination present at the former unlined pit by initiating pit remediation as described in PNM's unlined surface impoundment management plan. When groundwater contamination was detected in the monitoring well emplaced in the former pit location, PNM initiated remediation in accordance with its groundwater management plan. Remediation activities included excavation of the former pit; vertical profiling to assess the vertical extent of contamination; installation of a monitoring well network; and operation of a free product recovery system.

Q. WHAT EFFECT DID PNM'S FREE PRODUCT RECOVERY SYSTEM HAVE ON THE THICKNESS OF FREE PRODUCT IN THE VICINITY OF THE FORMER PIT?

A. PNM's product recovery system removed over 1050 gallons of free phase hydrocarbons from the groundwater, prior to the system being destroyed by Burlington's excavation activities at the site in October 1998. As shown on PNM Exhibit 59, despite the recovery of over 1050 gallons of free phase hydrocarbons, free product levels in MW-2 were not decreasing substantially, suggesting an areally extensive free product or liquid hydrocarbon source was continuing to

distribute itself across the site. PNM Exhibit 59 shows that product thickness decreased from over four feet to two feet. However, despite continued removal of free product, the free product thickness on the groundwater remained relatively constant at the two-foot level.

Q. HOW MUCH FREE PRODUCT DID BURLINGTON REMOVE DURING ITS MOST RECENT EXCAVATION ACTIVITIES?

A. As reported to PNM Witness Sikelianos, Burlington recovered approximately 50 gallons of free product in the course of its remediation activities in October 1998 through February 1999

Q. WHY DID PNM UNDERTAKE HYDROCARBON RECOVERY IF IT WAS NOT THE PARTY RESPONSIBLE FOR SUCH CONTAMINATION?

A. PNM was complying with an OCD directive to initiate remedial action. Initiating remedial action is not an admission of responsibility for the release and PNM had raised concerns to OCD, from the initial recovery of free product at this site, that PNM did not release free product at this site. Further data collected by PNM demonstrated that the free phase hydrocarbons were part of a large volume, areally extensive free phase hydrocarbon plume that originated at locations upgradient from PNM operations. PNM notified OCD of these findings and subsequently appealed the OCD directive of March 13, 1998 requesting further action regarding free phase contamination. PNM Exhibit 10 shows that the OCD was highly specific in that it requested PNM to "remove the remaining source

areas with free hydrocarbons in the vicinity of and immediately downgradient of the pit". PNM appealed this directive on the basis that PNM did not discharge free phase hydrocarbons into the subsurface and therefore does not have any additional source areas with free hydrocarbons. Pending the November 1998 OCD hearing, PNM continued to operate the existing free phase hydrocarbon recovery system in MW-6 until such time as Burlington pulled it from the ground in October 1998.

Q. HAVE THE POTENTIAL SOURCES OF CONTAMINATION IN THE VICINITY OF PNM'S FORMER OPERATIONS BEEN COMPLETELY REMEDIATED?

A. Yes. PNM previously removed almost all of the contaminated soils from its former pit location. In late 1998 and early 1999, Burlington removed soils between the base of the former pit location extending several feet into the water table in November 1998 as shown in PNM Exhibit 56. PNM also removed over 1,050 gallons of free product from the groundwater, as shown on PNM Exhibit 59. Because of this work, PNM has no existing source of contamination in place and remediation of the former PNM pit has been completed. There are no PNM sources of hydrocarbon contamination remaining that could pose a threat to groundwater.

Q. TO YOUR KNOWLEDGE, HAS BURLINGTON UNDERTAKEN ANY REMEDIAL ACTIVITIES ASSOCIATED WITH HYDROCARBONS BENEATH THEIR OPERATIONS?

A. Burlington has submitted several reports describing rather limited investigation and remedial action to OCD (PNM Exhibits 30, 31, 34, and 36), which I have reviewed. Until October 1998, Burlington remediation activities included only an incomplete excavation in the vicinity of their former above ground storage tank battery, the installation and sampling of temporary wells, and trenching and netting installed in the vicinity of the hydrocarbon seep at the northwest corner of the well pad. Burlington later installed monitoring wells MW-9, -10, -11, and -13. In November 1998 through February 1999, Burlington performed a phased excavation of portions of the Hampton 4M well site.

Q. WHAT HAVE BURLINGTON'S INVESTIGATIONS REVEALED, AS REPORTED TO OCD?

A. First, it is noteworthy that Burlington used the groundwater contour maps and well installation and analytical data prepared and paid for by PNM in its submittals to OCD for the Hampton 4M site. Therefore, Burlington must agree with PNM's conclusions drawn from this data. Specifically, PNM installed and performed much of the sampling associated with MW-1, MW-4, and MW-8, as well as measuring groundwater elevations for all wells at the site.

Second, the Burlington Report, which is PNM Exhibit 31, suggests that no hydrocarbon-contaminated areas were found in test holes. This claim is unsupported because only visual and PID readings were taken. No soil sample analytical data was provided. PID readings can be misleading as indicators of the presence of soil contamination. The PID measures non-specific organic vapors.

Vapors are mobile and are not necessarily indicators of hydrocarbons sorbed to a soil sample. For example, clean soils overlying free product contamination will give high vapor readings on a PID – readings that are well above OCD guidelines. However, an analytical laboratory sample of the soil will reveal low BTEX and total hydrocarbon concentrations because the soil itself is not contaminated. This is the case for the soil sample obtained from Burlington boring SB-2 installed through PNM's former pit (PNM Exhibit 15). A soil sample with a PID reading in excess of 2,000 ppm was clean relative to OCD closure guidelines, demonstrating that soils beneath PNM's former pit were clean and not the source of free phase hydrocarbons (PNM Exhibit 48). The PID readings were likely the result of organic vapors volatilizing from underlying free product. PNM submits that PID readings should not be used to close sites or make remedial decisions concerning the full extent of excavation in the absence of confirmatory soil sampling performed by an analytical laboratory.

Third, Burlington identifies two sources of contamination – the former PNM pit and a second source located "upgradient of monitoring well MW-4 supplying a dissolved-phase component" (PNM Exhibit 34). MW-4 has free product in it and lies directly downgradient of the Burlington excavation. Wells installed subsequent to MW-4, MW-8 and MW-10, also show significant free product. It is clear that significant free product contamination resides in the vicinity of Burlington's operations, including in the area of Burlington's former above

ground storage tanks, at locations substantially upgradient from PNM's former pit.

Fourth, at one time, Burlington speculated that an off-site source was the cause of contamination beneath their operations (PNM Exhibit 34). Installation of MW-1 indicated that this was not the case and that the source of contamination upgradient of MW-4 lies on the well pad, beneath equipment owned and operated by Burlington.

Sources of hydrocarbon contamination remain in place, as documented by Burlington's own data, as developed by their consultant Philip Services, and data from monitoring wells MW-12 and MW-13 installed and sampled subsequent to this excavation.

Q. **IN YOUR OPINION, HAS BURLINGTON ADEQUATELY COMPLETED INVESTIGATION AND REMEDIATION OBLIGATIONS AT THIS SITE?**

A. In my opinion, Burlington's work at the site is incomplete and in many ways has been inadequate. PNM Exhibit 30, an April 15, 1997 report from Burlington to OCD, describes that a source monitoring well will be placed in the center of their excavation and sampled for BTEX and TPH. This well has never been installed. Additionally, PNM is not aware of any assessment performed by Burlington in the vicinity of their separator pit prior to the start of excavation in that area.

PNM Exhibit 31, an August 1997 report from Burlington to OCD, documents a chronology. The April 30, 1997 entry discusses excavation of a tank discharge pit, but does not provide any tabulation of PID results or other data to back up the

stated conclusion that no hydrocarbon-contaminated areas were found in test holes. Temporary wells installed by Burlington showed free product (TPW-2) and high dissolved phase BTEX concentrations (TPW-5 and –7). PNM believes TPW-5 and TPW-7 may also have revealed the presence of free product had these wells been left in place as permanent monitoring points.

In PNM Exhibit 34, Burlington's report of September 19, 1997 to OCD, Burlington states that if no upgradient sources are found, Burlington will conclude the source is on the well pad and that Burlington will aggressively locate sources using a PID and will excavate these sources. We presume this is the excavation undertaken by Burlington in December 1997 described in PNM Exhibit 36. PNM's resampling of soils at the water table exposed in Burlington's excavation (PNM Exhibit 48) reveal that soils still remaining at this location are above OCD closure guidelines and, therefore, contamination remains in place. Burlington further stated that their source removal activities were complete and that decreasing concentrations in MW-4 would soon bear this out. Contrary to this assertion by Burlington, concentrations in MW-4 continued to increase over time, with benzene increasing first relative to overall BTEX, and the subsequent appearance of free product (PNM Exhibit 48). Remediation was obviously not successful in removing hydrocarbon sources that were contributing free phase and dissolved phase hydrocarbons to this well.

In PNM Exhibit 37, Burlington's report to OCD of January 30, 1998, Burlington describes further sampling and well installation. Again, contrary to Burlington's

statement that BTEX levels drop in MW-4, benzene concentrations in MW-4 increase over time and eventually lead to the appearance of free product as shown in PNM Exhibit 48. Nor do free product levels in MW-8 substantially decrease or disappear. Burlington's Attachment 5 to PNM Exhibit 37 depicts the fictional cross-section discussed in greater detail previously.

Burlington hired Philips to conduct its mass excavation performed in October 1998 through February 1999. According to the Philip Report dated March 3, 1999 which is PNM Exhibit 60, Burlington did not undertake direct free phase hydrocarbon remediation or groundwater remediation, other than by pumping liquids accumulated in the only areas excavated to the water table. These areas were in the vicinity of PNM's former pit. Significantly, Burlington did not open excavations to the water table in the vicinity of their current or former operations and has, therefore, not performed free product or groundwater remediation in the vicinity of their own operations.

Q. IN YOUR OPINION, HAS BURLINGTON COMPLETED THE NECESSARY REMEDIATION ACTIVITIES IN THE AREA OF ITS FORMER PIT?

A. No. In the Burlington Report included as PNM Exhibit 30, Burlington erroneously concludes they reached the vertical extent of contamination underlying their former storage tank battery and focused subsequent efforts on the horizontal extent of contaminated soil. I don't believe the vertical extent of contamination in this area was adequately defined. A sample obtained by PNM

from Burlington's open excavation at the water level still showed soil contamination in excess of OCD guidelines. Monitoring wells downgradient of Burlington's excavation have increasing concentrations and/or free product present, thus the horizontal extent of contamination has also not been addressed. I believe that the horizontal extent related to Burlington's contamination extends fully offsite and downgradient as dissolved phase groundwater contamination caused by the continued presence of tens of thousands of gallons of free product. In PNM Exhibit 31, Burlington states that if off-site contamination were not proven, it would undertake further investigation on site. I am not aware that Burlington performed additional investigation in the vicinity of their present excavation of a scope similar to their October and November 1998 excavations in the vicinity of PNM's former pit. Burlington did not perform extensive excavations to and beneath the water table in the vicinity of their own operations.

Q. WERE BURLINGTON'S REMEDIATION EFFORTS IN THE VICINITY OF ITS FORMER TANK BATTERY COMPLETE?

A. No. Burlington performed excavation to a depth of 15 feet in the vicinity of their former storage tank battery. Burlington's own data from soil borings drilled prior to the excavation indicate soil samples in the interval of 15 to 16 feet are contaminated at concentrations above OCD guidelines indicating contaminated soils were left in place. PNM notified OCD of this fact and expressed its opinions to OCD in a letter dated March 31, 1998, included as PNM Exhibit 22.

Q. **WHAT IS YOUR OPINION OF THE DOCUMENTATION BURLINGTON HAS PROVIDED TO DOCUMENT ITS INVESTIGATION AND REMEDIATION ACTIVITIES AT THE HAMPTON 4M SITE?**

A. Burlington, in the past, has relied largely on data collected by PNM including groundwater contour maps, well installation, surveying, sampling, etc. and has included such work in their reports to OCD. In past reports, Burlington has installed temporary wells to monitor for free product, when such wells are inadequate in design to detect free product – specific examples being TPW-5 and TPW-7. PNM's work has been misrepresented to OCD as work performed by Burlington. Burlington's own work at this site has been poorly documented, with the most recent excavation activity being a prime example (PNM Exhibit 60, Philip Report of March 1999). The Phillip report fails to document total cubic yards of soils removed, the management and disposal of such soils, the health and safety protections used, sampling locations do not have any type of survey control, very few soil analytical samples are collected relative to the large quantities of soils removed, and there are no confirmation soil samples collected to demonstrate that Burlington removed contamination to closure guidelines.

Q. **WHAT DO DATA IN THE PHILIP REPORT, PNM EXHIBIT 60, INDICATE ABOUT WHETHER BURLINGTON SUCCESSFULLY REMOVED CONTAMINATION FROM ITS OWN PIT AREA?**

A. As shown on PNM Exhibit 63, PID readings in the excavations performed near Burlington's pit increase consistently with depth, demonstrating that contamination is in fact left in place at depth.

Q. WHAT DOES THE PRELIMINARY DATA SHOW ABOUT THE SUCCESS OF BURLINGTON'S REMEDIATION EFFORTS?

A. The remedial actions of November 1998 through February 1999 were unsuccessful in removing hydrocarbon contaminant sources as indicated by increasing groundwater concentrations and/or indications of product sheen in newly installed wells MW-12 and MW-13. These increased concentrations are shown on PNM Exhibit 48. These wells indicate that sources of groundwater contamination remain in the subsurface.

Q. **WHAT WAS SHOWN AS A RESULT OF BURLINGTON'S REMEDIAL ACTIONS IN THE AREA OF PNM'S FORMER PIT IN NOVEMBER 1998?**

A. As described in the Philip Services report to Burlington (PNM Exhibit 60) and the photographs described by PNM witness Sikelianos, Burlington undertook a massive excavation in the vicinity of the former PNM pit only to discover, upon removing all soil from beneath the PNM pit, that free product continued to seep in from upgradient sidewalls of the excavation. This source is continuing to contaminate groundwater, and will continue to move in response to the hydraulic gradient, allowing recontamination of soils beneath the former PNM pit on

backfilling. It is this continuing source that should be addressed and PNM is asking the OCC to rule that it should be Burlington's responsibility to address both the free phase hydrocarbons and their overwhelming contribution to the dissolved phase contamination in groundwater.

Q. DID BURLINGTON EXTEND THIS EXCAVATION ACTIVITY TO INCLUDE THEIR FORMER ABOVE GROUND STORAGE TANK BATTERY AND CURRENT EQUIPMENT AT THE HAMPTON 4M WELL SITE?

A. Only partially. In addition, it does not appear that Burlington uniformly excavated to depths below the water table as they did in the area of PNM's former pit (PNM Exhibit 60). Hydrocarbon contamination near the former PNM unlined pit was found primarily at the water table and below. Burlington focused its efforts on completely removing PNM's former unlined pit. In the course of this effort, Burlington discovered that groundwater is not simply perched and that it was not simple to dewater the area. Burlington also found that an ongoing free product source was continuing to contaminate groundwater in the vicinity of PNM's former pit from upgradient sources. Instead of pursuing these upgradient sources by extending excavations to the water table and below, Burlington simply performed additional soil removal at shallower depths and ceased further activities that might have lead to hydrocarbon source removal.

Q. WHAT IS PNM'S POSITION WITH RESPECT TO WHETHER ITS FORMER OPERATIONS MIGHT HAVE CONTRIBUTED TO DISSOLVED PHASE PRODUCT AT THE HAMPTON 4M WELL?

A. We acknowledge that PNM is a potential source of dissolved phase contamination. However, the magnitude of PNM's contribution to dissolved phase contamination is dwarfed by the magnitude of free phase and dissolved phase contamination released from Burlington's operations that has now overrun any dissolved phase contamination contributed by PNM.

Q. **WHAT INDICATORS WOULD SHOW SUCCESSFUL REMEDIATION WAS ACHIEVED BY BURLINGTON?**

A. If Burlington's excavation activities were truly successful in removing hydrocarbon sources for groundwater contamination, one would expect to see decreasing dissolved phase concentrations with time. Instead, dissolved phase concentrations are fairly high in BTEX and are increasing with time in newly installed wells MW-12 and MW-13 (PNM Exhibit 48). While obtaining groundwater samples for analysis in May 1999, PNM staff observed a sheen on the water obtained from MW-12. Based on this observation, we expect that free product may yet arrive and recontaminate the location near MW-12. Three indicators suggest that remediation was not successful: dissolved phase concentrations are increasing with time, the benzene concentrations are increasing more quickly than other constituents, and based on sheen noted in the latest round of sampling in MW-12, there is evidence that free product will recontaminate

areas that were excavated. Therefore, one must conclude that upgradient sources of hydrocarbon contamination remain in place in areas beneath Burlington's equipment and operations, as all soils associated with PNM's former pit were removed by Burlington in November 1998 through February 1999.

Q. HOW EFFECTIVE HAVE BURLINGTON'S REMEDIATION ACTIVITIES BEEN AT ADDRESSING DISSOLVED PHASE GROUNDWATER CONTAMINATION ORIGINATING AT THE HAMPTON 4M WELL SITE?

A. Burlington has not undertaken any remedial actions to address dissolved phase groundwater contamination at this site. Burlington did install a downgradient well near the access road to the Hampton 4M well site, MW-11. Groundwater quality data indicate that water in this well is below WQCC standards; however, benzene was detected at 0.8 ppb in the May 1999 sampling event, as summarized in PNM Exhibit 48. The hydrocarbon seep was sampled by OCD in April 1999. Results from this sampling show that the seep is still actively contributing benzene at 40 ppb, a concentration in excess of WQCC standards as reflected in the OCD letter to Burlington date May 5, 1999 which is PNM Exhibit 18. Monitoring wells MW-12 and MW-13, installed since the completion of Burlington's excavation activities show high (greater than 1,000 ppb benzene) and increasing dissolved phase concentrations on the well pad. Again, this suggests that Burlington's remediation activities have not effectively removed the

sources of hydrocarbons contributing to dissolved-phase groundwater contamination.

Q. WHAT ARE THE POSSIBLE SOURCES OF DISSOLVED PHASE HYDROCARBONS IN GROUNDWATER RELATED TO THE HAMPTON 4M WELL SITE?

A. Possible sources of dissolved phase hydrocarbons associated with the Hampton 4M well site can include: free phase hydrocarbons on the water table that are dissolving into groundwater, releasing benzene, toluene, ethylbenzene, and xylenes (BTEX), among other soluble constituents; soil contamination leached by rainfall; dilute hydrocarbon contaminants discharged into the soil and percolating to the groundwater. The release mechanisms vary. As shown on PNM Exhibit 4, multiple release points may be responsible for free phase hydrocarbons at this site including: above ground storage tank leaks and improper equipment cleaning or management practices; pipeline leaks; blowdown to the soil and/or atmosphere resulting in soil contamination; casing leaks at the Hampton 4M wellhead; discharges of dissolved phase hydrocarbons to unlined pits; and other discharges of hydrocarbons resulting in soil contamination, and free and dissolved phase hydrocarbons in groundwater.

Q. **IN YOUR OPINION, WHAT IS THE PRINCIPAL CONTRIBUTOR OF DISSOLVED PHASE HYDROCARBONS AT THIS SITE?**

A. Unquestionably it is the large volume of free phase hydrocarbons on the groundwater and soils contaminated with hydrocarbons beneath the water table at

the Hampton 4M well pad. This is a large volume of concentrated hydrocarbons continuously dissolving BTEX and other constituents to the groundwater.

Q. **WHAT IS YOUR UNDERSTANDING OF THE MAGNITUDE AND EXTENT OF DISSOLVED PHASE HYDROCARBONS?**

A. The magnitude and extent of dissolved phase hydrocarbons are illustrated by benzene concentration contours as shown on PNM Exhibits 57 and 62. These exhibits illustrate the free phase and dissolved phase hydrocarbon distribution in the subsurface. Free phase hydrocarbons essentially underlie the entire well pad, extending from MW-4 to the northwest passing through MW-2 and terminating at the foot of the well pad, at the hydrocarbon seep. Almost 5 feet of free product had initially been detected on groundwater. The extent of free phase contamination is actually underrepresented on the exhibits, as data from Burlington TPW-5 and -7 could also have been included as representative of areas with free phase hydrocarbons based on the high dissolved-phase concentrations detected in these wells. The dissolved phase contamination associated with this free phase hydrocarbon source is also shown. Dissolved-phase contamination extends off-site to the locations of wells MW-5 and MW-7. The 1,000 part per billion benzene contour extends to the farthest downgradient monitoring well installed by PNM, MW-7. The groundwater standard for benzene in a non-drinking water source is 10 parts per billion. The full downgradient, vertical, and lateral extent of the dissolved phase plume in groundwater is not known at this time. PNM sampled the Everett-Burton supply well shown as the "EB" well on

PNM Exhibit 57 and did not find evidence of contamination above laboratory detection limits. The furthest downgradient well is a new well (MW-11) located at a distance of approximately 1800 feet from MW-1, installed by Burlington. Recent sampling of MW-11 by Burlington indicated the presence of BTEX constituents at concentrations below WQCC groundwater standards as indicated in PNM Exhibit 48. However, the presence of benzene at a concentration of 0.8 ppb merits additional monitoring to assess whether or not benzene levels are increasing. At present, the dissolved phase plume, as defined by benzene concentrations greater than 10 parts per billion, extends between 800 (MW-7) and 1800 (MW-11) feet downgradient from MW-1. This is a highly unusual dissolved-phase migration distance for typical PNM dehydrator sites, as summarized in PNM Exhibit 25. Sites with no free product are typically less than 50 feet in migration distance and 72% attenuate naturally with no active remediation required. At other sites where free product has been identified, there are always other sources of free phase hydrocarbons, usually attributable to the producer. PNM believes the producer, Burlington, is the source of free phase hydrocarbons at the Hampton 4M site. PNM has no history of free product releases at dehydrator sites in the absence of releases caused by others.

Q. WHAT WOULD BE THE PRIMARY SOURCE FOR ANY CONTRIBUTION TO DISSOLVED PHASE CONTAMINATION BY PNM?

A. PNM's contributions to dissolved phase would have come primarily from rainfall leaching through soils with some hydrocarbons. PNM did not contribute free phase contamination to the subsurface. Based on the relative magnitude of free phase hydrocarbon contributions at this Site, the arbitrary line of demarcation drawn by OCD gave PNM a highly disproportionate share of contamination.

Q. **DID PNM PERFORM ANY OFF-SITE REMEDIATION ACTIVITIES TO ADDRESS DISSOLVED GROUNDWATER CONTAMINATION?**

A. PNM installed several offsite monitoring wells (MW-5 and MW-7) and conducted a soil boring/temporary monitoring well installation program along the arroyo to determine the offsite extent of dissolved groundwater contamination. PNM stopped its offsite characterization upon reaching the Williams pipeline at MW-7. PNM also sampled a private well in the area, the Everett-Burton supply well. The private well appears to be slightly cross-gradient to groundwater flow. PNM continued to monitor groundwater quality as outlined in its groundwater management plan, even while waiting resolution on this matter from OCD and now OCC. PNM did not take any other actions at offsite locations to address dissolved phase groundwater contamination. However, PNM removed over 1,050 gallons of free product thereby removing significant hydrocarbon mass from the subsurface that represents a continuing source of dissolved-phase contamination. Prior to the November 1998 OCD hearing, PNM was the only party actively addressing free phase hydrocarbon contamination at the Hampton 4M site. Unless the true source of free phase hydrocarbons is identified and removed,

actions to mitigate dissolved groundwater contamination in a cost-effective manner are unlikely. PNM believes that Burlington is the responsible party for free phase hydrocarbon contamination and, therefore, the ongoing dissolved phase contamination.

Q. WHAT IS YOUR UNDERSTANDING REGARDING THE ORIGIN OF THE OCD "LINE OF DEMARCATION" DRAWN IN THE FIELD TO APPORTION RESPONSIBILITY AT THIS SITE?

A. At the original hearing in this matter Mr. Bill Olsen of NMOCD drew a line in the sand on the north side of TPW-1, -2, and 3 (PNM Exhibit 9) and used this line to divide responsibility for contamination cleanup between PNM and Burlington. PNM was allotted cleanup responsibility for all contamination north of the line, Burlington was allotted cleanup responsibility for all contamination south of the line.

Q. **IN YOUR OPINION, DID THIS LINE TAKE INTO ACCOUNT WHO HAD RELEASED CONTAMINANTS INTO THE SUBSURFACE?**

A. Perhaps, only as the line pertained to soil contamination. However, the arbitrary line in the sand did not take into account which party contributed to groundwater contamination and gave PNM a highly disproportionate share of responsibility for the groundwater contamination. PNM's former equipment and operations were downslope and downgradient of Burlington's operations. Therefore, contamination released by Burlington at locations upgradient of PNM would migrate underneath PNM's equipment and on past the well pad and downgradient

offsite. This arbitrary line automatically placed all downgradient cleanup responsibility on PNM, including significant contamination contributed from Burlington that migrated beyond the line in response to natural hydraulic gradients. This fixed line does not take into account the fact that hydrocarbons in groundwater move with time. Over time, PNM is accorded a highly disproportionate share of groundwater contamination by allocating on the basis of an arbitrary line that does not account for the continual movement of contaminants from upgradient sources to locations beneath and downgradient of PNM's former unlined pit.

Q. IS A "LINE IN THE SAND" A REASONABLE MEANS OF ALLOCATING GROUNDWATER REMEDIATION RESPONSIBILITY?

A. No, groundwater is not a stationary matrix. At this site, the rate of groundwater flow is fairly fast at 50 to 500 feet per year. As shown in cross-section (PNM Exhibit 62), contaminants released by Burlington at upgradient locations would quickly move through the subsurface, downgradient, underflowing beneath PNM's area of former operations, and would then continue to flow offsite. An indicator of this offsite migration is the hydrocarbon seep located at the northwest corner of the well pad. The offsite migration of contaminants will continue until the source of contamination is stopped and remediated, and/or the natural attenuation processes remove as much hydrocarbon as the source is releasing. In either case, the degree of downgradient contamination will be extensive due to the relatively fast movement of groundwater at this site. Thus, a fixed line in the sand

puts a progressively disproportionate share of contamination on the downgradient party, in this case, PNM.

Q. **IN YOUR OPINION, DID THIS LINE OF DEMARCATION TAKE INTO ACCOUNT WHO HAD RELEASED FREE PHASE HYDROCARBONS AS THE MAJOR SOURCE OF CONTAMINANTS INTO THE SUBSURFACE?**

A. No, because the majority of free phase hydrocarbons were produced, managed, stored, and disposed of by Burlington. PNM equipment was not designed to handle free phase hydrocarbons and the PNM former unlined pit did not show evidence of a free phase hydrocarbon release from the pit, through the soil column, onto underlying groundwater. Free phase liquid hydrocarbons recovered from the subsurface belong to Burlington by contract. Even the free phase Burlington took liquid hydrocarbons recovered during PNM's free phase hydrocarbon remediation for sale or disposal. The continuing presence of free phase hydrocarbons in the subsurface provides a continuous source of dissolved phase contamination. Dissolved phase contamination was not considered in a reasonable manner – that is, by considering each party's contribution and the types of releases, the fact that contaminant sources are not created equal – free phase hydrocarbons constitute a long-term continuous source of contamination to groundwater as opposed to dissolved phase releases, and the line of demarcation did not consider contaminant behavior and movement in the subsurface.

Q. HOW WOULD YOU ALLOCATE RESPONSIBILITY FOR CONTAMINATION THAT MOVES?

A. I would look at who discharged the types of contaminants causing the contamination, the types of contaminant sources – in this case free product released by Burlington and potential dissolved phase released by PNM, and the relative magnitudes of impact that those sources have on the environment. Continuing sources contribute to greater overall contamination than one-time, pulsing sources, or sources that have been removed. Burlington has a continuing source of free phase hydrocarbons at this site because they have not addressed contaminated soil present at or below the water table. PNM did not release free phase hydrocarbons to groundwater at this site. PNM sources of dissolved phase groundwater contamination have all been physically removed as of the winter of 1998. Dissolved phase groundwater impacts caused by PNM's former dehydrator pit would typically extend less than 50 feet and be remediated by natural attenuation in about 8 quarters, as testified by PNM Witness Gannon and shown on PNM Exhibit 25. The fact that Burlington's releases have overridden any dissolved phase plume contributed by PNM's former pit is what complicates this site. Understanding that free product is a continuing source of dissolved phase contamination, one must look to remediating the free phase first. In this case, Burlington is the party that released and continues to release free phase hydrocarbons and should therefore be responsible for remediating all of the free phase and dissolved phase groundwater contamination at this site.

Q. CAN YOU SUMMARIZE THE MAJOR ISSUES ASSOCIATED WITH THIS SITE?

A. Yes. PNM Exhibit 1 shows a comparison between PNM and Burlington addressing major site issues. PNM is not a current operator, owner, or producer; PNM does not control site access; it does not produce or own the liquids; and did not manage or release free phase hydrocarbons at this site. PNM's former dehydrator discharges were limited to residual and dissolved phase hydrocarbons, except possibly in cases of system upset due to Burlington's equipment malfunctions. All hydrocarbon sources attributable to PNM have been physically removed and PNM has recovered more free phase hydrocarbons than it could reasonably have released. PNM has completed all reasonable remediation activities at this site related to discharges caused by PNM's former equipment.

By contrast, Burlington is the current operator/owner/producer at this site. Burlington produced, managed, discharged, and owns the free phase hydrocarbons. Subsurface soils in the vicinity of Burlington's former tank batteries and other equipment have documented contamination remaining in place that continues to act as a source of free phase and dissolved phase hydrocarbons. Burlington, as the current owner/operator and the party that owned, managed, and discharged free phase hydrocarbons, should be the party responsible for all further investigation and remediation at this site.

Q. BASED ON YOUR ASSESSMENT OF THE TECHNICAL DATA REGARDING RELEASES AT THIS SITE AND REMEDIAL ACTIVITIES

PERFORMED TO DATE, WHAT IS YOUR RECOMMENDATION TO THE COMMISSION REGARDING DISPOSITION OF THIS CASE?

A. Based on site data, parties responsible for the bulk of contaminant release, and remediation work accomplished to date, I would apportion as follows: (1) PNM would be responsible for remediating soil contamination in the vicinity of their former pit – this has been accomplished by both PNM and Burlington activities, PNM has no ongoing sources of contamination to groundwater at this time, therefore, PNM should be finished with the pit remediation portion of the site and be granted pit closure by NMOCD; (2) PNM would not be responsible for any further investigation or remediation of free phase or any associated dissolved phase contamination based on the amount of free phase hydrocarbons recovered by PNM to date relative to maximum possible discharges via the former PNM pit, and the complete removal of any ongoing hydrocarbon sources attributable to PNM; (3) Burlington would be responsible for remediating all soil, free phase, and dissolved phase contamination remaining at the site and moving downgradient.

Q. ARE THE OPINIONS IN YOUR TESTIMONY BASED UPON YOUR EDUCATION, TRAINING, AND EXPERIENCE IN THE ENVIRONMENTAL FIELD?

A. Yes.

Q. ARE YOUR OPINIONS BASED UPON REASONABLE SCIENTIFIC CERTAINTY?

A. Yes.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION COMMISSION

IN THE MATTER OF THE HEARING CALLED
BY THE OIL CONSERVATION COMMISSION
FOR THE PURPOSE OF CONSIDERING:

APPLICATION OF PUBLIC SERVICE COMPANY OF NEW MEXICO FOR *DE NOVO* HEARING ON ORDER NO. R-11134 ISSUED BY THE NEW MEXICO OIL CONSERVATION DIVISION IN

CASE NO. 12,033

AFFIDAVIT

STATE OF NEW MEXICO)
)SS.
COUNTY OF BERNALILLO)

I, Valda I. Terauds, upon being first duly sworn according to law, under oath, depose and state: That I am Senior Scientist - Hydrologist for Mission Research Corporation, and that I have read the foregoing Direct Testimony, including exhibits. I further affirmatively state that I know the contents thereof and that they are true and correct to the best of my knowledge and belief.

SIGNED this 9th day of July, 1999.

Valda I. Terauds
VALDA I. TERAUDS

SUBSCRIBED AND SWORN to before me this 9th day of July, 1999.

(Seal, if any)

Notary Public

[My Commission Expires: Oct. 22, 1999]

DAM0256

000418