

*Denny E. Faust*  
DEPUTY OIL & GAS INSPECTOR

District I  
P.O. Box 1980 Hobbs NM  
District II  
P.O. Drawer DD, Artesia, NM 88221  
District III  
1000 Rio Brazos Rd, Aztec, NM 87410

JUN 23 1998

State of New Mexico  
Energy, Minerals and Natural Resources Department

OIL CONSERVATION DIVISION

2040 South Pacheco Street  
Santa Fe, New Mexico 87505

SUBMIT 1 COPY TO  
APPROPRIATE  
DISTRICT OFFICE  
AND 1 COPY TO  
SANTA FE OFFICE

*Approved*  
**PIT REMEDIATION AND CLOSURE REPORT**

|  |   |  |  |
|--|---|--|--|
| <b>Operator:</b> PNM Gas Services (Caulkins)   |   | <b>Telephone:</b> 324-3764                     |  |
| <b>Address:</b> 603 W. Elm Street Farmington, NM 87401   |   |  |  |
| <b>Facility or Well Name:</b> Breech E #89   |   |  |  |
| <b>Location:</b>   | Unit <u>L</u>   | Sec <u>3</u>                                   | T <u>26 N</u> R <u>6 W</u> County <u>Rio Arriba</u>  |
| <b>Pit Type:</b>   | Separator <input type="checkbox"/>  | Dehydrator <input checked="" type="checkbox"/> | Other <input type="checkbox"/>                       |
| <b>Land Type:</b>  | BLM <input checked="" type="checkbox"/>   | State <input type="checkbox"/>                 | Fee <input type="checkbox"/> Other <u>No</u>         |
| <b>Pit Location:</b>   | Pit dimensions: length <u>20</u> width <u>20</u> depth <u>3</u>   |  |  |
| (Attach diagram)   | Reference: wellhead <input checked="" type="checkbox"/> other <input type="checkbox"/>  |  |  |
|  | Footage from reference: <u>120'</u>   |  |  |
|  | Direction from reference: <u>80</u> Degrees <input type="checkbox"/> East <input type="checkbox"/> North <input type="checkbox"/> |  |  |
|  | <input checked="" type="checkbox"/> West <input checked="" type="checkbox"/> South  |  |  |
| <b>Depth to Ground Water:</b>  | Less than 50 feet<br>50 feet to 99 feet<br>Greater than 100 feet  |  | (20 points)<br>(10 points)<br>(0 points)<br><u>0</u> |
| (Vertical distance from contaminants to seasonal high water elevation of ground water)                           |   |  |  |
| <b>Wellhead Protection Area:</b>   | Yes<br>No   |  | (20 points)<br>(0 points)<br><u>0</u>                |
| (Less than 200 feet from a private domestic water source, or, less than 1,000 feet from all other water sources) |   |  |  |
| <b>Distance to Surface Water:</b>  | Less than 200 feet<br>200 feet to 1,000 feet<br>Greater than 1,000 feet   |  | (20 points)<br>(10 points)<br>(0 points)<br><u>0</u> |
| (Horizontal distance to perennial lakes)   |   |  |  |
| <b>RANKING SCORE (TOTAL POINTS):</b>   |   |  | <u>0</u>   |

Breach E #89

Date Remediation Started: 7/25/97Date Completed: 7/25/97Remediation Method: Excavation XApprox. Cubic Yard 171

(Check all appropriate sections)

Landfarmed XAmount Landfarmed (cubic yds) 171

Other \_\_\_\_\_

Remediation Location:

Onsite X

Offsite \_\_\_\_\_

(i.e., landfarmed onsite, name and location of offsite facility)

Backfill Material Location: \_\_\_\_\_

## General Description of Remedial Action:

Excavated contaminated soil to a pit size of 16' X 18' X 18' and landfarmed soil onsite within a bermed area at a depth of 6" to 12". Soil was aerated by disking/plowing until soil met regulatory levels.\*\*\* Bedrock encountered at 26'. See attached risk analysis form and laboratory analysis.Ground Water Encountered: No ✓ Yes \_\_\_\_\_ Depth \_\_\_\_\_

## Final Pit Closure Sampling:

Sample Location Bottom of excavation.

(if multiple samples, attach sample result and diagram of sample locations and depths.)

Sample depth 21'Sample date 7/25/97 Sample time 11:15:00 AM

## Sample Results

Benzene (ppm) 5.7840Total BTEX (ppm) \*\*\* 443.5240

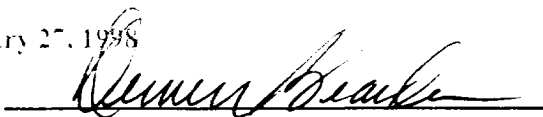
Field headspace (ppm) \_\_\_\_\_

TPH (ppm) 386.00 Method 8015AVertical Extent (ft) 26' Risk Assessment form attached Yes ✓ No \_\_\_\_\_Ground Water Sample: Yes \_\_\_\_\_ No ✓ (If yes, see attached Groundwater Site Summary Report)

I HEREBY CERTIFY THAT THE INFORMATION ABOVE IS TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND MY BELIEF

DATE January 27, 1998

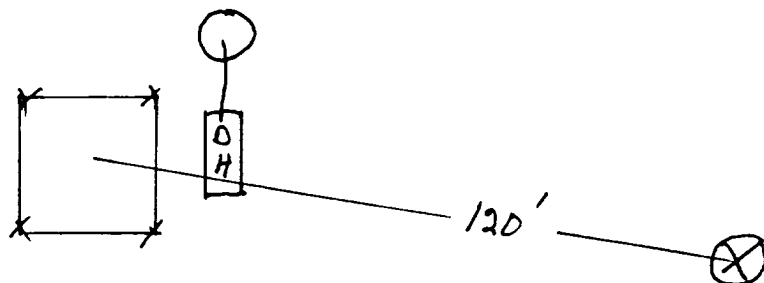
SIGNATURE

PRINTED NAME Denver Bearden  
AND TITLE Administrator III

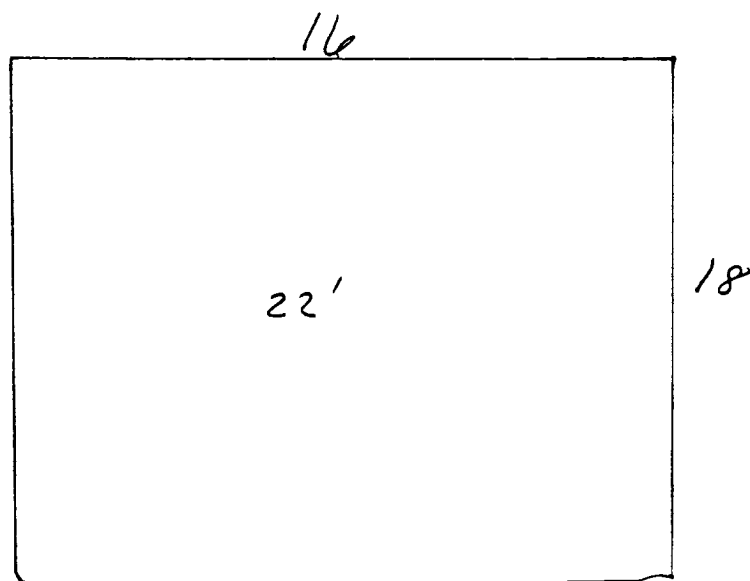
Breach # 89 E  
Cankins Oil  
Sec. 3, 26 N, 6 W, L

7-25-97

Start of excavation:



End of excavation:



**P.O. BOX 2606 • FARMINGTON, NM 87499**

OFF: (505) 325-5667



LAB: (505) 325-1556

### ANALYTICAL REPORT

Attn: *Denver Bearden*  
Company: *PNM Gas Services*  
Address: *603 W. Elm*  
City, State: *Farmington, NM 87401*

Date: *31-Jul-97*  
COC No.: *5945*  
Sample No.: *15494*  
Job No.: *2-1000*


Project Name: *PNM Gas Services - Breech #89E*  
Project Location: *9707251115; Bottom @ 21'*  
Sampled by: *GC* Date: *25-Jul-97* Time: *11:15*  
Analyzed by: *HR* Date: *30-Jul-97*  
Sample Matrix: *Soil*

#### Laboratory Analysis

| Parameter           | Results as Received | Unit of Measure | Limit of Quantitation | Unit of Measure |
|---------------------|---------------------|-----------------|-----------------------|-----------------|
| <i>Benzene</i>      | <i>5784</i>         | <i>ug/kg</i>    | <i>2500</i>           | <i>ug/kg</i>    |
| <i>Toluene</i>      | <i>42473</i>        | <i>ug/kg</i>    | <i>2500</i>           | <i>ug/kg</i>    |
| <i>Ethylbenzene</i> | <i>32568</i>        | <i>ug/kg</i>    | <i>2500</i>           | <i>ug/kg</i>    |
| <i>m,p-Xylene</i>   | <i>333890</i>       | <i>ug/kg</i>    | <i>2500</i>           | <i>ug/kg</i>    |
| <i>o-Xylene</i>     | <i>28809</i>        | <i>ug/kg</i>    | <i>2500</i>           | <i>ug/kg</i>    |
|                     | <i>TOTAL</i>        | <i>443524</i>   |                       | <i>ug/kg</i>    |

ND - Not Detected at Limit of Quantitation

**Method** - *SW-846 EPA Method 8020A Aromatic Volatile Organics by Gas Chromatography*

*Approved by*   
*Date* *7-31-97*

OFF: (505) 325-5667



LAB: (505) 325-1556

### ANALYTICAL REPORT

Attn: *Denver Bearden*  
Company: *PNM Gas Services*  
Address: *603 W. Elm*  
City, State: *Farmington, NM 87401*

Date: *4-Aug-97*  
COC No.: *5945*  
Sample No.: *15495*  
Job No.: *2-1000*

Project Name: *PNM Gas Services - Breech #89E*  
Project Location: *9707251145; Walls @ 16'*  
Sampled by: *GC* Date: *25-Jul-97* Time: *11:45*  
Analyzed by: *HR/DC* Date: *31-Jul-97*  
Sample Matrix: *Soil*

#### Laboratory Analysis

| Parameter                                | Results as Received | Unit of Measure | Limit of Quantitation | Unit of Measure |
|--|---------------------|-----------------|-----------------------|-----------------|
| <i>Diesel Range Organics (C10 - C28)</i> | <i>13</i>           | <i>mg/kg</i>    | <i>5</i>              | <i>mg/kg</i>    |

ND - Not Detected at Limit of Quantitation

#### Quality Assurance Report

DRO QC No.: 0548-STD

#### Continuing Calibration Verification

| Parameter                       | Method Blank | Unit of Measure | True Value | Analyzed Value | RPD        | RPD Limit  |
|---------------------------------|--------------|-----------------|------------|----------------|------------|------------|
| <i>Diesel Range (C10 - C28)</i> | <i>ND</i>    | <i>ppm</i>      | <i>200</i> | <i>192</i>     | <i>4.3</i> | <i>15%</i> |

#### Matrix Spike

| Parameter                     | 1 - Percent Recovered | 2 - Percent Recovered | Limit           | RPD      | RPD Limit  |
|-------------------------------|-----------------------|-----------------------|-----------------|----------|------------|
| <i>Diesel Range (C10-C28)</i> | <i>86</i>             | <i>88</i>             | <i>(70-130)</i> | <i>3</i> | <i>20%</i> |

Method - EPA 8210-1011-1012-1013-1014-1015-1016-1017-1018-1019-1020-1021-1022-1023-1024-1025-1026-1027-1028-1029-1030-1031-1032-1033-1034-1035-1036-1037-1038-1039-1040-1041-1042-1043-1044-1045-1046-1047-1048-1049-1050-1051-1052-1053-1054-1055-1056-1057-1058-1059-1060-1061-1062-1063-1064-1065-1066-1067-1068-1069-1070-1071-1072-1073-1074-1075-1076-1077-1078-1079-1080-1081-1082-1083-1084-1085-1086-1087-1088-1089-1090-1091-1092-1093-1094-1095-1096-1097-1098-1099-1100-1101-1102-1103-1104-1105-1106-1107-1108-1109-1110-1111-1112-1113-1114-1115-1116-1117-1118-1119-1120-1121-1122-1123-1124-1125-1126-1127-1128-1129-1130-1131-1132-1133-1134-1135-1136-1137-1138-1139-1140-1141-1142-1143-1144-1145-1146-1147-1148-1149-1150-1151-1152-1153-1154-1155-1156-1157-1158-1159-1160-1161-1162-1163-1164-1165-1166-1167-1168-1169-1170-1171-1172-1173-1174-1175-1176-1177-1178-1179-1180-1181-1182-1183-1184-1185-1186-1187-1188-1189-1190-1191-1192-1193-1194-1195-1196-1197-1198-1199-1200-1201-1202-1203-1204-1205-1206-1207-1208-1209-1210-1211-1212-1213-1214-1215-1216-1217-1218-1219-1220-1221-1222-1223-1224-1225-1226-1227-1228-1229-1230-1231-1232-1233-1234-1235-1236-1237-1238-1239-1240-1241-1242-1243-1244-1245-1246-1247-1248-1249-1250-1251-1252-1253-1254-1255-1256-1257-1258-1259-1260-1261-1262-1263-1264-1265-1266-1267-1268-1269-1270-1271-1272-1273-1274-1275-1276-1277-1278-1279-1280-1281-1282-1283-1284-1285-1286-1287-1288-1289-1290-1291-1292-1293-1294-1295-1296-1297-1298-1299-1300-1301-1302-1303-1304-1305-1306-1307-1308-1309-1310-1311-1312-1313-1314-1315-1316-1317-1318-1319-1320-1321-1322-1323-1324-1325-1326-1327-1328-1329-1330-1331-1332-1333-1334-1335-1336-1337-1338-1339-1340-1341-1342-1343-1344-1345-1346-1347-1348-1349-1350-1351-1352-1353-1354-1355-1356-1357-1358-1359-1360-1361-1362-1363-1364-1365-1366-1367-1368-1369-1370-1371-1372-1373-1374-1375-1376-1377-1378-1379-1380-1381-1382-1383-1384-1385-1386-1387-1388-1389-1390-1391-1392-1393-1394-1395-1396-1397-1398-1399-1400-1401-1402-1403-1404-1405-1406-1407-1408-1409-1410-1411-1412-1413-1414-1415-1416-1417-1418-1419-1420-1421-1422-1423-1424-1425-1426-1427-1428-1429-1430-1431-1432-1433-1434-1435-1436-1437-1438-1439-1440-1441-1442-1443-1444-1445-1446-1447-1448-1449-1450-1451-1452-1453-1454-1455-1456-1457-1458-1459-1460-1461-1462-1463-1464-1465-1466-1467-1468-1469-1470-1471-1472-1473-1474-1475-1476-1477-1478-1479-1480-1481-1482-1483-1484-1485-1486-1487-1488-1489-1490-1491-1492-1493-1494-1495-1496-1497-1498-1499-1500-1501-1502-1503-1504-1505-1506-1507-1508-1509-1510-1511-1512-1513-1514-1515-1516-1517-1518-1519-1520-1521-1522-1523-1524-1525-1526-1527-1528-1529-1530-1531-1532-1533-1534-1535-1536-1537-1538-1539-1540-1541-1542-1543-1544-1545-1546-1547-1548-1549-1550-1551-1552-1553-1554-1555-1556-1557-1558-1559-1560-1561-1562-1563-1564-1565-1566-1567-1568-1569-1570-1571-1572-1573-1574-1575-1576-1577-1578-1579-1580-1581-1582-1583-1584-1585-1586-1587-1588-1589-1590-1591-1592-1593-1594-1595-1596-1597-1598-1599-1600-1601-1602-1603-1604-1605-1606-1607-1608-1609-1610-1611-1612-1613-1614-1615-1616-1617-1618-1619-1620-1621-1622-1623-1624-1625-1626-1627-1628-1629-1630-1631-1632-1633-1634-1635-1636-1637-1638-1639-1640-1641-1642-1643-1644-1645-1646-1647-1648-1649-1650-1651-1652-1653-1654-1655-1656-1657-1658-1659-1660-1661-1662-1663-1664-1665-1666-1667-1668-1669-1670-1671-1672-1673-1674-1675-1676-1677-1678-1679-1680-1681-1682-1683-1684-1685-1686-1687-1688-1689-1690-1691-1692-1693-1694-1695-1696-1697-1698-1699-1700-1701-1702-1703-1704-1705-1706-1707-1708-1709-1710-1711-1712-1713-1714-1715-1716-1717-1718-1719-1720-1721-1722-1723-1724-1725-1726-1727-1728-1729-1730-1731-1732-1733-1734-1735-1736-1737-1738-1739-1740-1741-1742-1743-1744-1745-1746-1747-1748-1749-1750-1751-1752-1753-1754-1755-1756-1757-1758-1759-1760-1761-1762-1763-1764-1765-1766-1767-1768-1769-1770-1771-1772-1773-1774-1775-1776-1777-1778-1779-1780-1781-1782-1783-1784-1785-1786-1787-1788-1789-1790-1791-1792-1793-1794-1795-1796-1797-1798-1799-1800-1801-1802-1803-1804-1805-1806-1807-1808-1809-1810-1811-1812-1813-1814-1815-1816-1817-1818-1819-1820-1821-1822-1823-1824-1825-1826-1827-1828-1829-1830-1831-1832-1833-1834-1835-1836-1837-1838-1839-1840-1841-1842-1843-1844-1845-1846-1847-1848-1849-1850-1851-1852-1853-1854-1855-1856-1857-1858-1859-1860-1861-1862-1863-1864-1865-1866-1867-1868-1869-1870-1871-1872-1873-1874-1875-1876-1877-1878-1879-1880-1881-1882-1883-1884-1885-1886-1887-1888-1889-1890-1891-1892-1893-1894-1895-1896-1897-1898-1899-1900-1901-1902-1903-1904-1905-1906-1907-1908-1909-1910-1911-1912-1913-1914-1915-1916-1917-1918-1919-1920-1921-1922-1923-1924-1925-1926-1927-1928-1929-1930-1931-1932-1933-1934-1935-1936-1937-1938-1939-1940-1941-1942-1943-1944-1945-1946-1947-1948-1949-1950-1951-1952-1953-1954-1955-1956-1957-1958-1959-1960-1961-1962-1963-1964-1965-1966-1967-1968-1969-1970-1971-1972-1973-1974-1975-1976-1977-1978-1979-1980-1981-1982-1983-1984-1985-1986-1987-1988-1989-1990-1991-1992-1993-1994-1995-1996-1997-1998-1999-2000-2001-2002-2003-2004-2005-2006-2007-2008-2009-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P.O. BOX 2606 • FARMINGTON, NM 87499

9-29-97 @ 1315

Breach E#89 (Land Farm on Breach E#89E (E) 3-26N-6W)

Coulkins

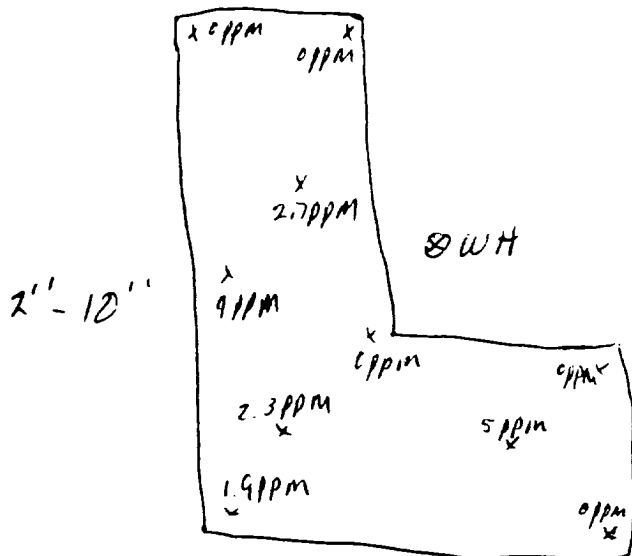
(L) 3-26N-6W

Rio Arriba

Sample # 9709291315

Land Farm field head space: 9.7 ppm

↑  
N





OFF: (505) 325-5667



LAB: (505) 325-1556

## ANALYTICAL REPORT

Attn: *Denver Bearden*  
 Company: *PNM Gas Services*  
 Address: *603 W. Elm*  
 City, State: *Farmington, NM 87401*

Date: *2-Oct-97*  
 COC No.: *5675*  
 Sample No.: *16443*  
 Job No.: *2-1000*

Project Name: *PNM Gas Services - Breech E #89 Landfarm*  
 Project Location: *9709291315; Composite*  
 Sampled by: *RH* Date: *29-Sep-97* Time: *13:15*  
 Analyzed by: *HR/DC* Date: *1-Oct-97*  
 Sample Matrix: *Soil*

### Laboratory Analysis

| Parameter                                | Results as Received | Unit of Measure | Limit of Quantitation | Unit of Measure |
|--|---------------------|-----------------|-----------------------|-----------------|
| <i>Diesel Range Organics (C10 - C28)</i> | <i>9</i>            | <i>mg/kg</i>    | <i>5</i>              | <i>mg/kg</i>    |

ND - Not Detected at Limit of Quantitation

### Quality Assurance Report

DRO QC No.: 0555-STD

#### Continuing Calibration Verification

| Parameter                       | Method Blank | Unit of Measure | True Value | Analyzed Value | RPD        | RPD Limit  |
|---------------------------------|--------------|-----------------|------------|----------------|------------|------------|
| <i>Diesel Range (C10 - C28)</i> | <i>ND</i>    | <i>ppm</i>      | <i>200</i> | <i>202</i>     | <i>1.2</i> | <i>15%</i> |

#### Matrix Spike

| Parameter                     | 1- Percent Recovered | 2 - Percent Recovered | Limit           | RPD       | RPD Limit  |
|-------------------------------|----------------------|-----------------------|-----------------|-----------|------------|
| <i>Diesel Range (C10-C28)</i> | <i>102</i>           | <i>92</i>             | <i>(70-130)</i> | <i>10</i> | <i>20%</i> |

Method - SW-846 EPA Method 8015, as modified by the following: 1. Use a 100 mL sample volume.

Approved by: *[Signature]*  
 Date: *10/2/97*

P.O. BOX 2606 • FARMINGTON, NM 87499

OFF: (505) 325-5667



LAB: (505) 325-1556

### ANALYTICAL REPORT

Attn: *Denver Bearden*  
Company: *PNM Gas Services*  
Address: *603 W. Elm*  
City, State: *Farmington, NM 87401*

Date: *24-Nov-97*  
COC No.: *5837*  
Sample No.: *16873*  
Job No.: *2-1000*

Project Name: *PNM Gas Services - Breech E #89*  
Project Location: *9711130930; 26' depth*  
Sampled by: *GC* Date: *13-Nov-97* Time: *9:30*  
Analyzed by: *DC/HR* Date: *18-Nov-97*  
Sample Matrix: *Soil*

#### Laboratory Analysis

| Parameter                                | Results as Received | Unit of Measure | Limit of Quantitation | Unit of Measure |
|--|---------------------|-----------------|-----------------------|-----------------|
| <i>Diesel Range Organics (C10 - C28)</i> | ND                  | mg/kg           | 5                     | mg/kg           |

ND - Not Detected at Limit of Quantitation

#### Quality Assurance Report

DRO QC No.: 0555-STD

#### Continuing Calibration Verification

| Parameter                       | Method Blank | Unit of Measure | True Value | Analyzed Value | RPD | RPD Limit |
|---------------------------------|--------------|-----------------|------------|----------------|-----|-----------|
| <i>Diesel Range (C10 - C28)</i> | ND           | ppm             | 200        | 201            | 0.7 | 15%       |

#### Matrix Spike

| Parameter                     | 1- Percent Recovered | 2 - Percent Recovered | Limit    | RPD | RPD Limit |
|-------------------------------|----------------------|-----------------------|----------|-----|-----------|
| <i>Diesel Range (C10-C28)</i> | 110                  | 113                   | (70-130) | 2   | 20%       |

Method - EPA 821-1, 821-2, 821-3, 821-4, 821-5, 821-6, 821-7, 821-8, 821-9, 821-10, 821-11, 821-12, 821-13, 821-14, 821-15, 821-16, 821-17, 821-18, 821-19, 821-20, 821-21, 821-22, 821-23, 821-24, 821-25, 821-26, 821-27, 821-28, 821-29, 821-30, 821-31, 821-32, 821-33, 821-34, 821-35, 821-36, 821-37, 821-38, 821-39, 821-40, 821-41, 821-42, 821-43, 821-44, 821-45, 821-46, 821-47, 821-48, 821-49, 821-50, 821-51, 821-52, 821-53, 821-54, 821-55, 821-56, 821-57, 821-58, 821-59, 821-60, 821-61, 821-62, 821-63, 821-64, 821-65, 821-66, 821-67, 821-68, 821-69, 821-70, 821-71, 821-72, 821-73, 821-74, 821-75, 821-76, 821-77, 821-78, 821-79, 821-80, 821-81, 821-82, 821-83, 821-84, 821-85, 821-86, 821-87, 821-88, 821-89, 821-90, 821-91, 821-92, 821-93, 821-94, 821-95, 821-96, 821-97, 821-98, 821-99, 821-100

Approved by: *[Signature]*

Date: *11/24/97*

P.O. BOX 2606 • FARMINGTON, NM 87499

OFF: (505) 325-5667



LAB: (505) 325-1556

## ANALYTICAL REPORT

Attn: *Denver Bearden*  
Company: *PNM Gas Services*  
Address: *603 W. Elm*  
City, State: *Farmington, NM 87401*

Date: *24-Nov-97*  
COC No.: *5837*  
Sample No.: *16873*  
Job No.: *2-1000*

Project Name: *PNM Gas Services - Breech E #89*  
Project Location: *9711130930; 26' depth*  
Sampled by: *GC* Date: *13-Nov-97* Time: *9:30*  
Analyzed by: *DC* Date: *18-Nov-97*  
Sample Matrix: *Soil*

### Laboratory Analysis

| Parameter           | Results<br>as Received | Unit of<br>Measure | Limit of<br>Quantitation | Unit of<br>Measure |
|---------------------|------------------------|--------------------|--------------------------|--------------------|
| <i>Benzene</i>      | ND                     | ug/kg              | 1                        | ug/kg              |
| <i>Toluene</i>      | 2                      | ug/kg              | 1                        | ug/kg              |
| <i>Ethylbenzene</i> | ND                     | ug/kg              | 1                        | ug/kg              |
| <i>m,p-Xylene</i>   | 7                      | ug/kg              | 1                        | ug/kg              |
| <i>o-Xylene</i>     | 2                      | ug/kg              | 1                        | ug/kg              |
|                     | <i>TOTAL</i>           | 11                 |                          | ug/kg              |

ND - Not Detected at Limit of Quantitation

**Method** - SW-846 EPA Method 8020A Aromatic Volatile Organics by Gas Chromatography

*Denver Bearden*  
Date: *11/24/97*



|                                       |                          |
|---------------------------------------|--------------------------|
| Well Name:                            | Breech E #89             |
| Well Legals:                          | Unit L, Sec 3, T26N, R6W |
| Pit Type:                             | Dehydrator               |
| Horizontal Distance to Surface Water: | Greater than 1,000 ft    |
| Groundwater Depth:                    | Greater than 100 ft      |

### **RISK ANALYSIS**

PNM requests closure of the Breech E #89 using a limited risk analysis of the site conditions.

1. PNM estimated groundwater to be at a depth of 200 ft. based upon elevation of site to the Largo Wash. (Reference: topographic map.)
2. This site is not located within 200 ft. of a domestic water well and is not within 1,000 ft. of any other water source.
3. Distance from the site to surface water is greater than 1,000 ft.
4. PNM excavated 171 cu. yds. from the former pit. Vertical extent was determined using a hollow stem drilling rig. Bedrock was encountered @ 26 ft. below ground surface.

Based upon the information provided above, PNM believes the Breech E #89 poses minimal risk to the environment. Subsurface lateral migration is limited based upon PNM's past experience in excavating 800 pits. Source removal minimizes the possibility of surface water contamination. Bedrock/sandstone provides a barrier between remaining contamination and groundwater. Vertical migration through bedrock or sandstone to groundwater is highly unlikely.