

# Practical Aspects in Estimating the Value of Oil & Gas Royalty Interests

## Purpose of Appraisal

An appraisal is done to estimate the value of a defined property on a particular date for a specific purpose. Appraisals of oil and gas rights are usually done to estimate a value for Federal and/or state gift or estate tax, or to establish a value for use in family/estate planning. The effective date of the appraisal is chosen by the user of the appraisal. The physical and economic conditions of the appraisal are those that exist on the effective date. The value of a royalty interest is the present value (the value today) of a future stream of income. In order to calculate the present value, a discount rate is used. A market value appraisal must use a market-based discount rate. Such a rate is commonly derived from a cost of capital calculation.

## Appraisal is Not Speculation

**Appraisal** is an ordered process of estimating value using accepted methodologies and appropriate data. Appraisals used for estimating value for tax purposes must conform to the prevailing version of the Uniform Standards of Professional Appraisal Practice (USPAP), definition of Fair Market Value, and other standards. The appraisal report should clearly state that the appraised value was derived in conformance to USPAP and the appraisal report itself must meet USPAP requirements.

**Speculation** is the creation of a “value” based on physical and/or economic conditions that do not exist for the subject property and which may have not a factual foundation. USPAP does not condone speculation in appraisal work.

## Fair Market Value

Appraisals done for Federal and state tax purposes must conform to the prevailing definition of Fair Market Value. To wit:

“The highest price estimated in terms of money that the land would bring if exposed for sale in the open market, with reasonable time allowed in which to find a purchaser, buying with the knowledge of all the uses and purposes to which it was adapted and for which it was capable of being used.” [*Sacramento Southern R. R. Co. V. Heilbron* 156 Cal. 408, 104 P. 979 (1909).] or,

“The most probable price, as of a specified date, in cash, or in terms equivalent to cash, or in other precisely revealed terms for which the specified property rights should sell after reasonable exposure in a competitive market under all conditions requisite to a fair sale, with

the buyer and seller each acting prudently, knowledgeably, and for self-interest, and assuming that neither is under duress.” [American Institute of Real Estate Appraisers, *The Appraisal of Real Estate*, 9<sup>th</sup> ed.]

Virtually all definitions of fair market value are comprised of the same elements. The only real difference is that some definitions refer to the “highest price” whereas other definitions refer to the “likely price”. The definition that should be used is the one applicable to the purpose of the appraisal and the jurisdiction in which it is applied.

## **Properties That Can Be Appraised**

The properties that may be subject to appraisal can be sorted into three broad categories:

- Producing - In this case the property, or a pooled unit that includes the property, is producing, there are sales of oil or gas, and the Lessor is receiving royalty income.
- Leased and Partially Developed - The property may or may not be included in a pooled unit. There may be drilling permits requested and/or approved; there may be a development plan in place; and there may be one or more wells drilled either on the property, or on a property with which it is pooled, but there is no production.
- Leased but Undeveloped - The oil and gas rights are leased. Geophysical surveys may have been conducted on the property. There may or may not be any well drilling permit requests submitted or approved for the property or nearby properties.

## **Generally Accepted Appraisal Practice**

An appraisal is done to estimate the (fair) market value of a property as of a certain date. All valid and acceptable appraisals occur in the context of basic appraisal methods. Oil and gas rights are considered, in most jurisdictions, to be real property. Generally accepted appraisal practice recognizes three approaches to estimate market value for real property.

The ***Cost Approach*** estimates value based on the cost to replace or reproduce a structure or facility. This method has no application to oil and gas property appraisal since the property cannot be reproduced or replaced by new construction regardless of investment. Each field and property is unique both in time and in terms of the development and operation of the property by the owner(s).

The ***Comparable Sales*** approach, which has wide usage in real estate appraisal, relies upon the comparison of one or more properties that have been sold to the property being appraised. This approach has very little use in the appraisal of oil and gas properties for several reasons. Unlike residential and commercial real estate, there is no common searchable database of transactions from which to draw information. The only information that may be available through publications or hearsay is that a certain property was sold and (sometimes) the estimated purchase price. The appraiser may be able to obtain some information about production, number of wells, oil gravity, and

other parameters from public sources but unlike a residential property, where the appraiser can obtain information from a multiple-listing service, there is no such source for oil and gas properties.

Oil and gas properties have most commonly been appraised by the ***Income Approach*** which estimates the present value of a future stream of income. This choice results from the recognition that the source of value is the income stream to be received; the concerns regarding the Cost and Comparable Sales methods noted above; and the knowledge that it is the method most commonly employed by investors in and appraisers of oil and gas producing properties. The use of the Income Approach requires that there be sufficient information on which to base a valid and reliable appraisal.

### **Appraisal of Producing Properties by the Income Approach**

The Income Approach as applied to the evaluation of oil and gas properties commonly takes one of two forms; the *discounted cash flow* or the *income multiple*. The *income multiple* is a simple method that is particularly useful for royalty interests with relatively low income (i.e., less than \$2,000 per year). The method uses an average of the monthly income over a three to five year period and multiplies that average by an appropriate number of months to estimate a value.

The *discounted cash flow* method of evaluation is more complex and requires more information. Ordinarily a property that has a reliable record of oil and/or natural gas production and sales should not be difficult to value. The common procedure is to (i) assemble the production and sales data from several years of operation for the wells or property, (ii) define the performance of the property as to production rates and decline trend(s), (iii) project the future production based on the performance history, (iv) estimate the future price of oil and/or gas and the income from sales of oil and/or gas, and (v) calculate the present value of the estimated income to the ownership interest being appraised.

#### **Assembling Data**

Using the Income Approach is dependent on the availability of production and sales information. In the appraisal of a royalty interest, the most important starting place is the monthly royalty statement(s). Depending on the format of the statement, information such as well names, production volumes (which may be sales volumes), sales prices, ownership interests, and any deductions from them can be extracted and used for an evaluation. If royalty payments are being received from more than one company the formats may be different but the information is usually the same. However, the statement data is often limited to production or sales volumes and do not usually provide performance information such as days of production and pressure data.

Accumulation of data from the royalty statements over one or more years can provide a sufficient basis for an appraisal. Many royalty owners track their income and the performance of the properties in which they own interests in an Excel or other spreadsheet.

The income statement data can be augmented by obtaining additional information from public and/or commercial data bases. The key to efficient use of a public database, such as the Texas

Railroad Commission (“RRC”) website database, or a commercial site, is to obtain the American Petroleum Institute (“API”) number for each well from the operator of the property (or whomever pays the royalty). Most companies will provide this information to royalty owners; some require more persistence than others. The API number is unique to each well and is easier to work with than the well name. Data on the RRC or IHS web-sites can be obtained by a search using nothing more than the API number. Depending on the website, the performance history and a wide range of other information for each well can be downloaded. The production history can be converted into production graphs (decline curves), which can then be used to project the future production of an individual well or a group of wells.

### **Production Performance**

Estimation of the historical and future production from a specific property can come from the property being evaluated or from other sources such as analogy properties or academic studies.

***Data From the Subject Property*** - The production and other data for each well or group of wells is used to create graphs of the production performance known, collectively, as “decline curves”. These decline curves usually illustrate the production history as monthly production over time. Other forms could be production rate as a function of the number of months of production, or the cumulative amount of oil or gas production. Regardless of the form of the graph, and in many evaluations several forms of decline curve might be constructed and used, the length of the production history for a given well or group of wells is critical to a rational appraisal.

In many oil and gas producing regions of the country there are long histories of documented production, definitive geology and a good understanding of operating costs. Evaluation of royalty interests in such regions is comparatively easy.

In contrast, the relatively short development history of the Marcellus and Eagle Ford shale plays means that there has not been sufficient time to determine how the formation in any particular area will respond and/or how the completion methodology used in the well or wells will effect the production performance. It should not be expected that all wells drilled into the formation, even if completed by the same operator using the same technology, would demonstrate similar performance.

Because of the difficulties in establishing production in some areas as well as the variability of early production in Marcellus wells, a minimum of six months stable production is necessary. Production from more than one well is preferred. Wells with 12-18 months of sustained and stable production can be valued using standard decline curve models. This early production data can be compared to data from other producing wells (when available), to models from other sources, and/or to data from published/academic studies. Published models from the Barnett and other shale oil/gas sources combined with data from longer term academic studies can also be used to extend the initial well data into the future.

***Analogy Production*** - When a well or group of wells does not have sufficient production history to use as a basis for evaluation, the next best source is to augment that data using production

information from similar wells as a model or an “analogy” for the subject property. An analogy well is usually in the same field, producing from the same geologic formation and preferably not far away from the subject well. The comparison data can be monthly production from nearby wells but this requires that a data base of information from other wells be available.

Evaluation of royalty interests in the Pennsylvania Marcellus Shale is a good example of the use of analogy models. Creation of a reliable model for wells in a specific area requires at least 24-36 months of performance data from a large number of wells, supplemented by information about the location of the wells and, where possible, completion methods. This information is not available for Marcellus wells. There is no regulation requiring monthly data reporting; there are no mapping services providing location information; and drilling and completion records are often delayed and/or are available only from commercial services. The only information available is the monthly royalty statement. Absent an expanded reporting system, years of accumulating data will be required to build reliable models for Marcellus production.

The most commonly used analogy for the Marcellus Shale is the performance of natural gas wells drilled in the Barnett Shale. The Barnett Shale has been in development for almost 15 years. There has been considerable professional publication discussing the geology, completion technology, and production performance of the Barnett Shale. Companies operating in the Barnett, such as Anadarko Petroleum, Chesapeake Energy, and Range Resources have all published production data, in the form of generic “decline curves”, for the Barnett and Haynesville shales. These curves show that production from both the Barnett and Haynesville Shales demonstrate rapid decline rates in the first 6-12 months of production, followed by lessening rates of decline over the next 12-48 months, until a relatively stable production rate is achieved and where the stabilized rate is only a fraction of the initial rate. This performance is a function of the geology of the shale reservoir and the method used to complete the well.

Where sufficient data is available, Marcellus wells appear to show the same form of early decline performance as demonstrated in the Barnett/Haynesville. Appraisals of early-development-stage producing wells can be done using the Barnett/Haynesville models and/or published generic Marcellus data but, until sufficient local data becomes available to build reliable Marcellus models, the appraised value must be viewed with caution.

The use of data from analogy wells (or leases or fields) is a commonly accepted procedure BUT it requires that certain criteria be met. The best analogy wells are those in the same lease or Unit or in the same field. Analogy wells are those whose geologic, engineering and production characteristics are identical (or closely similar) to the apparent characteristics of the subject well.

- ◆ **Location** - The analogy well should be in reasonably close proximity to the subject well. An adjacent property or one within a mile or two is best. For Pennsylvania Marcellus evaluation, wells should be within a  $\pm$  five mile radius. While somewhat arbitrary, this distance recognizes that the Marcellus is not fully developed and evaluated and that differences in the formation can occur that can effect production potential.

- ◆ **Geology** - While it is often assumed that the Marcellus or other formation is a consistent regional geologic unit, no rock strata created by sedimentary deposition is uniform; differences occur in the mineral composition of the shale, in the geo-mechanical structure of the shale intervals, and in the susceptibility of the formation to completion methods.
  
- ◆ **Completion Method** - While most Marcellus wells have been completed with horizontal wellbores and have been subjected to one or more hydraulic fracturing treatments, those procedures are not identical from well to well, have varied over time, and (depending upon their success) have produced differing production results.
  
- ◆ **Production Performance** - The primary purpose of using analogy wells is to use the experience of those wells to estimate the future production performance of the subject well. This requires a knowledge of the certain data from the analogy well(s), ideally:
  - Initial Production Rate
  - Following Monthly Production Rates
  - Initial Wellhead Pressure
  - Following Months Wellhead Pressure
  - Initial Gathering System Pressure

Absent access to this data from a large number of wells from private or company sources, the only data available is the information collected by state agencies such as RRC. These sources vary in content and quality as well as ease of access. There is often no monthly breakdown of production or producing days; no pressure data; and no mapping of production performance.

The evaluation of properties where production has not started depends upon analogy data to create a model for expected production, however, the estimation of the value of a specific property requires data which may or may not be available even if a production projection can be created. When will production start; at what rate; will there be gathering system constraints; what will be the ownership interest in the property? Assuming production starts, what will be the initial price of gas; what will be future prices; what deductions will be made from the royalty? Absent reliable information, the imposition of a value based on analogy data is not a valid method of appraisal.

*Academic Studies* - Several studies of Barnett and, more recently, Marcellus performance tend to support the generic models. These studies benefit from the use of data provided by the operating companies including daily production rates, pressure measurements, formation properties, and completion data. These studies cannot be replicated using royalty owner data but they can be used to support or reinforce estimates made from monthly data.

### **Economic Evaluation**

While the estimate of future oil and/or gas production is the essential part of any property evaluation, it is the projection of future product prices, operating costs, deductions from royalty, and taxes that converts the production into income and value.

*Product Prices* - Oil and gas prices are projected from an initial price, usually the average price in the months prior to the appraisal date. The prices can come from the royalty statement or from another source such as “posted” prices or information from the purchaser. When prices have been particularly volatile, an average over several months might be prudent along with a comparison to historical trends. There is, however, no correct method for projecting the initial price(s) into the future especially over the expected life of an oil well. Unlike a production projection which should have a passing connection to the physics of fluid flow, oil and gas prices are susceptible to constantly changing economic, political, and geopolitical forces. For a market value appraisal, the use of a market-based projection of prices is usually acceptable; the NYMEX commodity futures market is a readily accessible source of market data. Projection of the initial product price using the NYMEX trend for oil and/or gas prices at or about the appraisal date is a reasonable approach.

*Operating Costs* - The cost of operating a well or property, when compared to the revenue produced by the property determines the income from the property and economic life of the property. In appraisal practice, production and income continue until the revenue from sales of oil and/or gas is no longer sufficient to cover the costs of production; this point is termed the “economic limit of production”. Royalty interest owners are not commonly charged for operating costs and, consequently, rarely have access to operating costs. In lieu of calculating an economic limit, running an evaluation to a specified life of 12 to 15 years is acceptable.

*Deductions from Royalty* - While a royalty interest may not be charged for the costs of operation of a well or property, there may be certain deductions from the royalty income that are either allowed by the terms of the lease or are imposed by the operator. Deductions from royalty are more common for natural gas production than for oil and include charges for gathering, treating, transporting, and marketing. In many instances, particularly in the Marcellus, some operators have been aggressive in their interpretation of lease terms and charges of \$1.00 or more per MCF of gas have occurred. These deductions must be considered in appraising the royalty interest.

*Present Value* - The value of a royalty interest is the present value (the value today) of a future stream of income. In order to calculate the present value, a discount rate is used. A market value appraisal must use a market-based discount rate. Such a rate is commonly derived from a cost of capital calculation.

## **Appraisal of Partially Developed/Non-Producing Properties**

It is not uncommon to be asked to estimate a value for a property that is “partially developed”. The extent of “partial development” of the subject property must be defined.

- Are there any wells drilled on the property?
- Are there well or wells that have been drilled but have not been placed in production?
- Are there any wells drilled on adjacent/adjoining properties?
- Are there producing wells nearby?
- Have drilling permits been issued for the subject property and/or for adjacent

properties?

- Has the operator issued a Notice of Development for the property?
- Are there well pads built on the property?
- How far away is the nearest producing well?
- Is it operated by the same company as the subject property?
- How far away is the nearest oil or gas gathering pipeline?
- If there are no wells drilled or in progress on the property, how much time remains in the primary term of the lease?
- Is the property part of a “pooled unit” and, if so, what share of the production and sales from the unit would be paid to the owner of the oil and gas rights?

It may be tempting to say that since the Lessee has made some efforts toward development, such as building a well pad or running a seismic survey, there is “value added” to the property. But that value, if any, does not accrue to the royalty interest. Further, depending on the language of the lease, such actions could be construed as “operations” and could take the lease out of the “primary term” of the lease. This could result in (a) the cessation of delay rental payments and/or (b) remove the possibility of any anticipated bonuses from extension of the lease or re-leasing of the property.

As a practical appraisal matter, the degree and form of partial development has little or no impact on the value of the oil and gas rights. Absent a change in the lease terms or the start of production, there has been no change in the income to the rights owner (Lessor). Aside from the start of royalty income, certain other events could occur that could effect the value of the rights.

***The Lessee does not drill but negotiates to renew and/or extend the lease for another period of time.*** Where there is no provision in the lease for automatic extension, the lessee would have to negotiate (1) a renewal or extension of the existing lease or (2) a new lease. The terms of a new/renewed/extended lease could include a bonus payment, increased royalty, and/or increased rental payment; however, the amounts of these payments cannot be estimated with any certainty. The estimation of the terms and duration of the new lease are subject to speculation, would include too many opportunities for material error, and would not likely provide a reliable estimate of value.

***The Lessee does not drill and allows the lease to terminate.*** A valuation under this circumstance anticipates that, on the expiry of the primary term, the Lessee does not extend or renew the lease but allows the lease to lapse. At that time, a new lease could be written with another Lessee that might bring a bonus payment and/or additional delay rental payments at a market rate, thereby creating a new income stream that could be valued.

Given the volatility of observed leasing offers and the apparent consolidation of leased-land positions by operators, the estimation of the terms that might be offered at some point in the future cannot be done with any degree of accuracy and; as with the valuation of future royalty revenue, would include too many opportunities for material error, and would not likely provide a reliable estimate of value.

*The Lessee finds uneconomic production and/or determines that a well is a dry hole and terminates further drilling.* In this case there is no royalty income to be valued and a very low likelihood of re-leasing the property to a third party.

The Lessor's interest, therefore, has some value or no value but neither circumstance can be known as of the appraisal date nor can the value of any future income, if any, be determined.

### **Appraisal of Leased Non-Developed/Non-Producing Properties**

Properties that are leased but have no development or production are not commonly appraised. However, special cases can arise that require development of a method of appraisal. As an example, the extensive and well publicized leasing of oil and gas rights in Pennsylvania in the 2007-2013 period led to a need to value these rights to establish a tax basis for newly formed corporations and for transfer and gift taxes. While there was no production or income from production, it was recognized that the rights had acquired a value due to the leasing of those rights. There was, and remains, no basis for imposing a value based on speculative future production and income.

The accepted approach is to value the oil and gas rights according to the terms of the lease. Depending on the date of the lease and the negotiating ability of the rights owner, the lease could provide income in the form of a bonus, delay rentals and, when and where applicable, an extension payment. The negotiation of the terms of the contract (lease) imparts an enhancement to the value to the Lessee (for access to the property) and a value to the Lessor that justifies allowing that access; the Lessor also retains the potential for future income if development occurs.

Example: The oil and gas rights to a property are encumbered by a lease signed in 2008 with a bonus of \$100,000 and annual delay rental of \$2,000. The rights could be valued in 2011 at \$100,000 plus \$6,000 (delay rentals received) plus the present value of the remaining delay rental (\$1,818 at 10%) resulting in a total of about \$108,818. Until production and royalties begin, this is the only source of income from the rights.

Note: The value of the subject rights is not influenced by the bonus and rentals paid for leases on other properties. The lease is a **contract** with the Lessee for a specific purpose and duration. The terms of the lease are not subject to re-negotiation during the life of the lease.

This approach has been used to value hundreds of properties in Pennsylvania since 2008. It has been subject to review by attorneys and tax professionals and has not been challenged by IRS or Pennsylvania authorities.

### **Mis-Use of So-Called "Sales" Data**

This is an attempt to use the Comparable or Comparative Sales Approach to value oil and gas rights. This method is very common in the appraisal of residential and farm properties as well as business and industrial properties. However, the method fails when applied to oil and gas

properties due to the lack of the necessary data to conduct a proper comparison between the comparable properties and the property being appraised.

In order to properly use the Comparable Sales approach, EACH transaction considered useful as a comparable property transaction must meet certain basic criteria:

- The Property must be defined and described as to location, size, etc.
- The Actual Purchase Price for the Property (preferably, the oil and gas rights) must be known.
- The status of the Oil and Gas Rights (leased, un-leased, pooled, etc.) must be known.
- If the property is leased, a copy of the complete lease (not the Memorandum of Lease) including all addenda, exhibits and attachments is necessary.
- There must be sufficient information on each comparable transaction to allow the properties to be compared to each other and to the subject property.
- No lunch counter data (otherwise known as “hearsay” or “gossip”) is acceptable.
- Adjustments must be made to the “value” of each of the comparable properties as compared to the subject property.

The following is a partial list of the characteristics that must be identified for each Comparable Sale.

- Location - Township, County
- Acreage of Comparable Property
- Original Lessee
- Current Operator if Different
- Date of Original Lease and Remaining Term
- Date of Extension and Remaining Term
- Bonus Amount Paid
- Delay Rental Amount Paid and Remaining Due
- Extension Payment Amount
- Royalty Rate
- Standard Lease Form or Modified by Additions
- Purchase Price for Property
- Did the Purchase Price Include the Surface Estate?
- Value of Surface Encumbered by the Oil and Gas Lease
- Payments for Surface Use and/or Damage
- Subject to Deductions From Royalty for Gathering, etc?
- Is the Property Pooled or Unitized?

- Division Orders Issued?
- Well Drilling Permits Requested? Approved?
- Is the Buyer Knowledgeable?
- Was the Seller Knowledgeable?
- Any Restrictions on Accessibility to the Property?
- Any Nearby Production?

Each of these characteristics must be compared to the same characteristics of the property being valued. Where there are differences, the value of the Comparable property must be adjusted to account for each difference. If there are five Comparable properties, the value of each must be adjusted. The five Sales can then be used to derive an indicator of value (such as \$/acre) which can then be applied to the property being appraised to estimate a value.

Example: The Subject Property has a Royalty of 12.5% while a Comparable Property has a 16% Royalty? How much of the Purchase Price of the Comparable is due to the Difference in Royalty Rate? What if the other Comparable Properties all have Different Royalty Rates?

Experience shows that, except in very rare circumstances, these criteria cannot be met; the method is not valid for valuation of oil and gas rights. The only valid method is the Income Approach.