

PROSPECTUS SUPPLEMENT NO. 3
(to Prospectus dated March 23, 2018)

169,933,626 Shares



GASTAR EXPLORATION INC.

Common Stock

This prospectus supplement is being filed to update and supplement information contained in the prospectus dated March 23, 2018, relating to the resale or other disposition of our common stock par value \$0.001 per share, which may be offered for sale from time to time by the selling stockholders named in the prospectus, with information contained in our Current Report on Form 8-K, filed with the Securities and Exchange Commission on May 14, 2018.

This prospectus supplement updates and supplements the information in the prospectus and is not complete without, and may not be delivered or utilized except in combination with, the prospectus, including any amendments or supplements thereto. This prospectus supplement should be read in conjunction with the prospectus and if there is any inconsistency between the information in the prospectus and this prospectus supplement, you should rely on the information in this prospectus supplement.

Investing in our securities involves risk. Please see “Risk Factors” beginning on page 3 of the prospectus for a discussion of certain risks that you should consider in connection with an investment in the securities.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or determined if this prospectus is truthful or complete. Any representation to the contrary is a criminal offense.

This prospectus supplement is dated May 14, 2018.

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 8-K

CURRENT REPORT
PURSUANT TO SECTION 13 OR 15(D) OF THE
SECURITIES EXCHANGE ACT OF 1934

Date of Report (Date of earliest event reported): May 8, 2018

GASTAR EXPLORATION INC.

(Exact Name of Registrant as Specified in its Charter)

DELAWARE
(State or other jurisdiction
of incorporation)

001-35211
(Commission File Number)

38-3531640
(IRS Employer
Identification No.)

1331 LAMAR STREET, SUITE 650
HOUSTON, TEXAS 77010

(Address of principal executive offices)

(713) 739-1800
(Registrant's telephone number, including area code)

Check the appropriate box below if the Form 8-K filing is intended to simultaneously satisfy the filing obligation of the registrant under any of the following provisions (see General Instruction A.2. below):

- Written communications pursuant to Rule 425 under the Securities Act (17 CFR 230.425)
- Soliciting material pursuant to Rule 14a-12 under the Exchange Act (17 CFR 240.14a-12)
- Pre-commencement communications pursuant to Rule 14d-2(b) under the Exchange Act (17 CFR 240.14d-2(b))
- Pre-commencement communications pursuant to Rule 13e-4(c) under the Exchange Act (17 CFR 240.13e-4(c))

Indicate by check mark whether the registrant is an emerging growth company as defined in Rule 405 of the Securities Act of 1933 (§ 230.405 of this chapter) or Rule 12b-2 of the Securities Exchange Act of 1934 (§ 240.12b-2 of this chapter).

Emerging growth company

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act.

SECTION 5 – CORPORATE GOVERNANCE AND MANAGEMENT

Item 5.02 Departure of Directors or Certain Officers; Election of Directors; Appointment of Certain Officers; Compensatory Arrangements of Certain Officers.

(d) Appointment of Directors.

On May 8, 2018, the board of directors (the “Board”) of Gastar Exploration Inc. (the “Company”) appointed Harry Quarls to the Board effective May 14, 2018. The Board affirmatively determined that Mr. Quarls is an “independent” director under the rules of the Securities and Exchange Commission (the “Commission”) and the NYSE American LLC.

Mr. Quarls currently serves as an independent director for Rosehill Resources Inc. (“Rosehill”), an independent oil and natural gas company. He was elected to the Rosehill board in April 2017. He also currently serves as chairman of the board of SH 130 Concessions Company LLC and as a director of Opal Resources LLC, a private oil and gas company. Mr. Quarls served as chairman of the board for Penn Virginia Corporation, an exploration and production company, from September 2016 until his retirement in February 2018. Mr. Quarls served as managing director at Global Infrastructure Partners from January 2009 until December 2017. He previously served as chairman of the board of US Oil Sands Corporation, an oil sands exploration and development company, from January to June 2017 and of Trident Resources Corporation, a natural gas exploration and production company, from October 2011 to August 2016. Mr. Quarls served as a director for Fairway Resources LLC, an independent oil and gas company, from February 2010 to December 2014. Additionally, Mr. Quarls served as managing director and practice leader for global energy as well as a member of the board of directors at Booz & Company, a leading international management consulting firm, from 1982 to 2007.

There are no arrangements or understandings between Mr. Quarls and the Company or any other persons pursuant to which Mr. Quarls was appointed to the Board. Mr. Quarls does not have any family relationship with any director or executive officer of the Company or any person nominated or chosen by the Company to become a director or executive officer. There are no family relationships and no transactions that would require disclosure pursuant to Item 404(a) of Regulation S-K. At this time, Mr. Quarls has not been appointed to any committee of the Board.

The Company will enter into an indemnification agreement with Mr. Quarls, which indemnification agreement is materially consistent with the Form of Indemnification Agreement, which was filed with the Commission on September 15, 2014 as Exhibit 10.1 to the Company’s Current Report on Form 8-K. The indemnification agreement generally requires the Company to (i) indemnify Mr. Quarls to the fullest extent permitted under Delaware law against liabilities that may arise by reason of his service to the Company and (ii) advance expenses reasonably incurred as a result of any proceeding against him as to which he could be indemnified.

In connection with Mr. Quarls appointment to the Board and pursuant to the Company’s compensation program for non-executive directors, Mr. Quarls was granted an initial equity award of 68,832 shares of restricted stock (the “Restricted Shares”). The Restricted Shares, which were issued under the Amended and Restated Gastar Exploration Inc. Long-Term Incentive Plan, will vest, subject to continued service, on January 30, 2019.

SECTION 7 – REGULATION FD

Item 7.01 Regulation FD Disclosures.

On May 14, 2018, the Company announced the addition of a new independent director to the Board. A copy of the Company’s press release, dated May 14, 2018, is furnished as Exhibit 99.1 to this Current Report on Form 8-K and is incorporated herein by reference.

In accordance with General Instruction B.2 of Form 8-K, the information presented herein under Item 7.01 and set forth in the attached press release included in Exhibit 99.1 to this report is deemed to be “furnished” solely pursuant to Item 7.01 of this report and shall not be deemed “filed” for purposes of Section 18 of the Securities Exchange Act of 1934, as amended (the “Exchange Act”), or otherwise subject to the liabilities of that section, nor shall such information or the exhibit be deemed incorporated by reference into any filing under the Securities Act of 1933, as amended or the Exchange Act.

SECTION 9 – FINANCIAL STATEMENTS AND EXHIBITS

Item 9.01 Financial Statements and Exhibits.

(d) Exhibits

The following is a list of exhibits furnished as part of this Form 8-K:

Exhibit No.	Description of Document
99.1	Press release dated May 14, 2018.

SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned hereunto duly authorized.

Date: May 14, 2018

GASTAR EXPLORATION INC.

By: /s/ Michael A. Gerlich
Michael A. Gerlich

Senior Vice President and Chief Financial Officer



NEWS RELEASE

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Gastar Exploration Announces New Independent Director

HOUSTON, May 14, 2018 – Gastar Exploration Inc. (NYSE American: GST) today announced that its board of directors (the “Board”) has appointed Harry Quarls to the Board effective today.

Mr. Quarls currently serves as an independent director for Rosehill Resources Inc., a publicly traded independent oil and natural gas company, a position he has held since April 2017. He also currently serves as chairman of the board of SH 130 Concessions Company LLC and as a director of Opal Resources LLC, privately-held companies. Mr. Quarls served as chairman of the board for Penn Virginia Corporation, a publicly traded exploration and production company, from September 2016 until his retirement in February 2018. He also previously served as chairman of the board of US Oil Sands Corporation and of Trident Resources Corporation, and was a director for Fairway Resources LLC.

Mr. Quarls served as managing director at Global Infrastructure Partners., a leading global, independent infrastructure investor from January 2009 until December 2017. Additionally, Mr. Quarls served as managing director and practice leader for global energy as well as a member of the board of directors at Booz & Company, a leading international management consulting firm, from 1982 to 2007.

Mr. Quarls earned an MBA from Stanford University and also holds ScM. and Bachelors of Science degrees, both in chemical engineering, from M.I.T. and Tulane University, respectively.

Jerry Schuyler, Gastar’s Chairman of the board of directors and interim CEO, said, “On behalf of the Board of Gastar Exploration, we are very pleased to welcome Harry Quarls to the Board and look forward to benefitting from his substantial knowledge. His outstanding qualifications include considerable financial and energy investing expertise, as well as experience on the boards of numerous public and private energy companies. This level of experience will be a tremendous asset as Gastar develops its quality acreage position in the STACK Play and works to build shareholder value.”

About Gastar Exploration

Gastar Exploration Inc. is a pure-play Mid-Continent independent energy company engaged in the exploration, development and production of oil, condensate, natural gas and natural gas liquids in the United States. Gastar's principal business activities include the identification, acquisition and subsequent exploration and development of oil and natural gas properties with an emphasis on unconventional reserves, such as shale resource plays. Gastar holds a concentrated acreage position in the normally pressured oil window of the STACK Play, an area of central Oklahoma which is home to multiple oil and natural gas-rich reservoirs including the Meramec, Oswego, Osage, Woodford and Hunton formations. For more information, visit Gastar's website at www.gastar.com.

Forward Looking Statements

This news release includes "forward looking statements" within the meaning of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended. Forward looking statements express our current expectations, opinion, belief or forecasts of future events and performance. A statement identified by the use of forward looking words including "may," "expects," "projects," "anticipates," "plans," "believes," "estimate," "will," "should," and certain of the other foregoing statements may be deemed forward-looking statements. Although Gastar believes that the expectations reflected in such forward-looking statements are reasonable, these statements involve risks and uncertainties that may cause actual future activities and results to be materially different from those suggested or described in this news release. These include risks described in Gastar's Annual Report on Form 10-K and other filings with the U.S. Securities and Exchange Commission ("SEC"), available at the SEC's website at www.sec.gov. By issuing forward looking statements based on current expectations, opinions, views or beliefs, Gastar has no obligation and, except as required by law, is not undertaking any obligation, to update or revise these statements or provide any other information relating to such statements.

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