

2018 State Damage Prevention Program Grants Final Report
CFDA Number: 20.720

Award Number: 693JK31840005PSDP

Project Title: State Damage Prevention (SDP) Program Grants - 2018

Date Submitted: *September 13, 2019*

Submitted by: *Rick Pevarski*

Specific Objective(s) of the Agreement

Under this grant agreement, the recipient will:

Launch a proof of concept pilot program exploring ways to add augmented reality images, or “experiences,” to the ticket taking process. Within this pilot program, partnering utilities, excavators, and locators can create augmented reality experiences detailing information about excavation sites. (Elements 1-9)

Work Scope:

Under the terms of this grant agreement, the Recipient will address the following applicable elements listed in the approved application, pursuant to 49 U.S.C. §60134 (a), (b).

- Element 1 (Effective Communications): Participation by operators, excavators, and other stakeholders in developing and implementing methods for establishing and maintaining effective communications between stakeholders—from receipt of an excavation notification to successful completion of the excavation, as appropriate. (Applicable)
- Element 2 (Comprehensive Stakeholder Support): A process for fostering and ensuring the support and partnership of stakeholders, including excavators, operators, locators, designers, and local government in all phases of the program. (Applicable)
- Element 3 (Operator Internal Performance Measurement): A process for reviewing the adequacy of a pipeline operator’s internal performance measures regarding persons performing locating services and quality assurance programs. (Applicable)
- Element 4 (Effective Employee Training): Participation by operators, excavators, and other stakeholders in developing and implementing effective employee training programs to ensure that operators, the one-call center, the enforcing agency, and the excavators have partnered to design and implement training for the employees of operators, excavators, and locators. (Applicable)
- Element 5 (Public Education): A process for fostering and ensuring active participation by all stakeholders in public education for damage prevention activities. (Applicable)
- Element 6 (Dispute Resolution): A process for resolving disputes that defines the State authority’s role as a partner and facilitator to resolve issues. (Applicable)
- Element 7 (Enforcement): Enforcement of State damage prevention laws and regulations for all aspects of the damage prevention process, including public education, and the use of civil penalties for violations assessable by the appropriate State authority. (Applicable)

- Element 8 (Technology): A process for fostering and promoting the use, by all appropriate stakeholders, of improving technologies that may enhance communications, underground pipeline locating capability, and gathering and analyzing information about the accuracy and effectiveness of locating programs. (Applicable)
- Element 9 (Damage Prevention Program Review): A process for review and analysis of the effectiveness of each program element, including a means for implementing improvements identified by such program reviews. (Applicable)

Accomplishments for the grant period (Item 1 under Agreement Article IX, Section 9.02 Final Report: “A comparison of actual accomplishments to the objectives established for the period.”)

Virginia Utility Protection Service, Inc. completed all objectives identified for the grant. The following list denotes accomplishments for this grant:

1. Vendor selected
 - a. Prostar
2. Contracts signed
 - a. Executed Professional Services Agreement with Vendor
3. Completed the Statement/Scope of Work with the vendor
4. Completed the Story Board of the Augmented Reality application
5. Purchased and implemented Secure Socket Layers to the Newtin System for the Single Address Ticket and the Augmented Reality application
6. Worked with the developers to create the Augmented Reality application
7. Tested the application in-house
8. Tested the application with both the locator and utility operator stakeholders
9. Conducted a survey on the tests

Purpose

The purpose of this storyboard is to introduce the use of Augmented Reality (AR) to improve the ability of the excavator to communicate the planned excavation details to the Locate Service Provider’s onsite locate technicians by enhancing the current Web Ticket Request process.

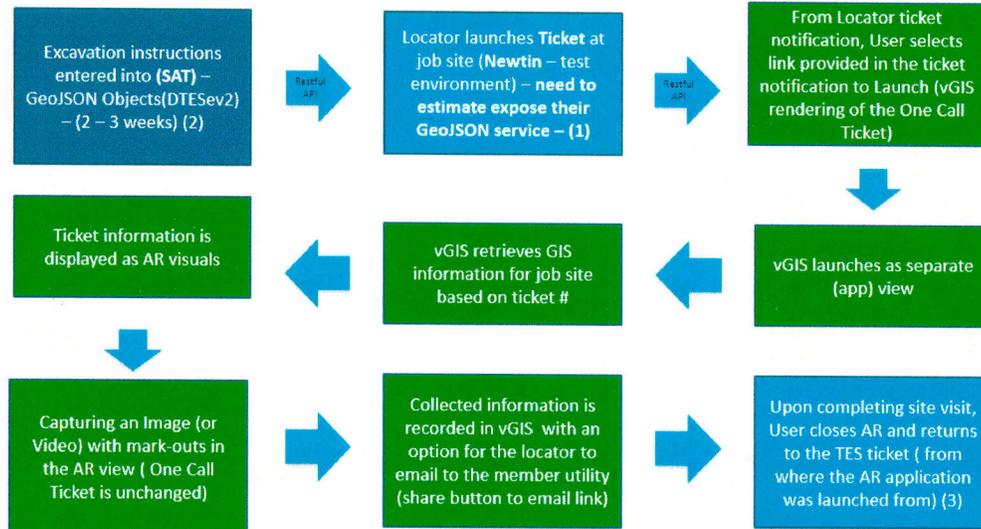
Background

The existing VA811 ticket requests have had significant functionality additions that will allow excavators to identify the location and nature of the proposed excavation activity by placing specific features on a map. The icons are geospatial objects such as polygons, lines and point features that are being plotted within the parcel boundaries on Single Address Tickets (SAT) by the excavator. This function lends itself to not only rendering the features in a two-dimensional map display but can be used to provide input for an Augmented Reality experience for the locate technician responding to the locate request. The business value of this technology is provided by improving communications between the excavator and the Locate Service provider in a damage prevention scenario.

Process Flow

The process work flow is as follows:

High-level workflow - PoC

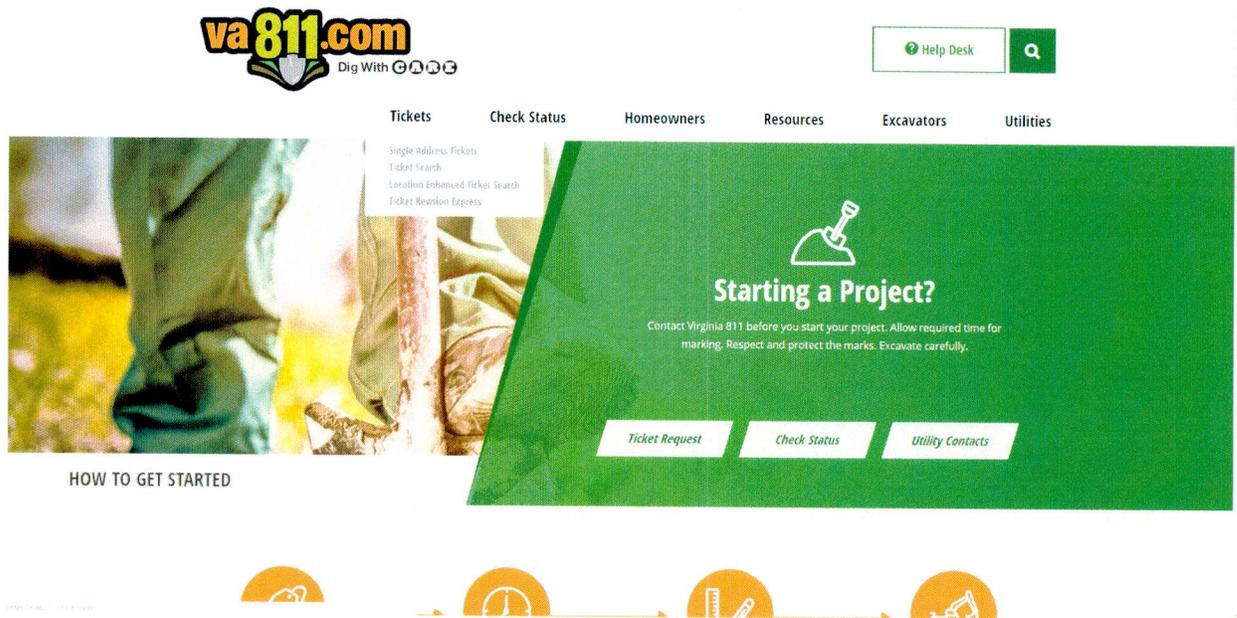


Process Steps

The existing Single Address Ticket Request functionality will provide the inputs required to allow the locator to view the proposed work location and the nature of the work in an onscreen display when at the location of the excavation.

Web Ticket Request provides AR content

The process is initiated by the excavator when they create a Single Address Ticket request that is accessed via the Virginia One Call Center website.



The user is then able to identify whether they are a Homeowner or a Contractor to access the form that is used to capture the details appropriate for them to enter.



Enters the dig site address and using an icon library in the upper right, identifies the nature and location of the work. These icons are mapped to equivalent icons in the Augmented Reality application and their locations are captured and sent along with the icons to the AR application. This provides the excavator a rich visual method to convey the site and nature of the work to the locate technician.

Start Over

Excavation Location

Address of where you are digging (street number, street name, and zip code) Lot/Unit/Building #

5201 Orchard Hill Dr Virginia 24019 #

Select a symbol from the dropdown to add to dig location

Tree



Facing the property from the street, please select from below to identify where you will be digging:

- Rear Left
- Rear Right
- Front Left
- Front Right
- Entire Property

Check the box next to any of the following statements that you would like to add to your locate request:

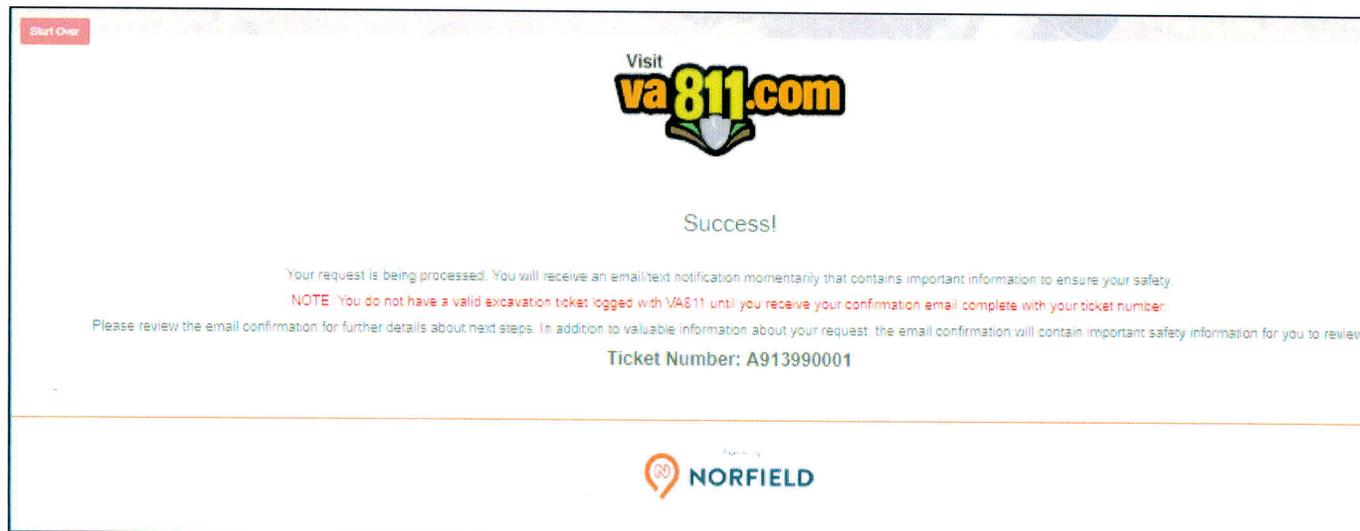
- Please do not mark on driveway, sidewalk and or patio
- Please use paint and flags if available

[Add Files](#) [Add Photos](#)

I confirm that the identified area(s) that I have selected, and any additional attachments, agree with where I am digging

Back [Next](#)

When the user submits the request, they receive a response with their ticket number identified.



The ticket request containing the GeoJSON objects required by AR are persisted in the database. Both the nature and location of the work items are captured and made available to the Augmented Reality application via an API that is embedded in the ticket notification that is sent via email to the member utility and the locator.

AR Link provided in Locate Notification email

When the email is generated to the member utility, they will forward that notification to the Locate Service Provider. The locate technician performing the locate will drive to the site, open the Augmented Reality Application on their mobile device by selecting the AR link provided in the email notification. If they are within 75 meters of the identified dig site location, the AR experience will be launched, and they will be able to view the proposed works on the mobile device view screen.

Render proposed works in AR.

- Provide a visual communication tool from the excavator to better convey the proposed works to the locator.

Value

- Locator is provided a content rich view of the nature and location of proposed work items.

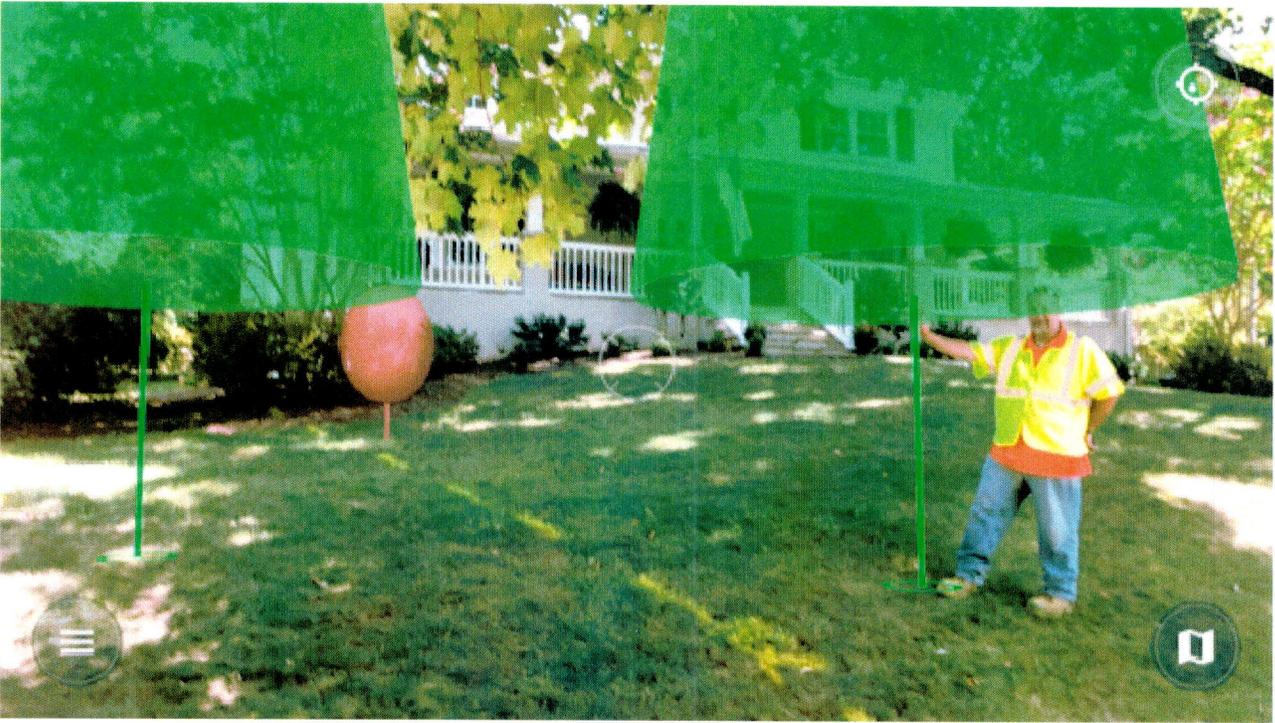
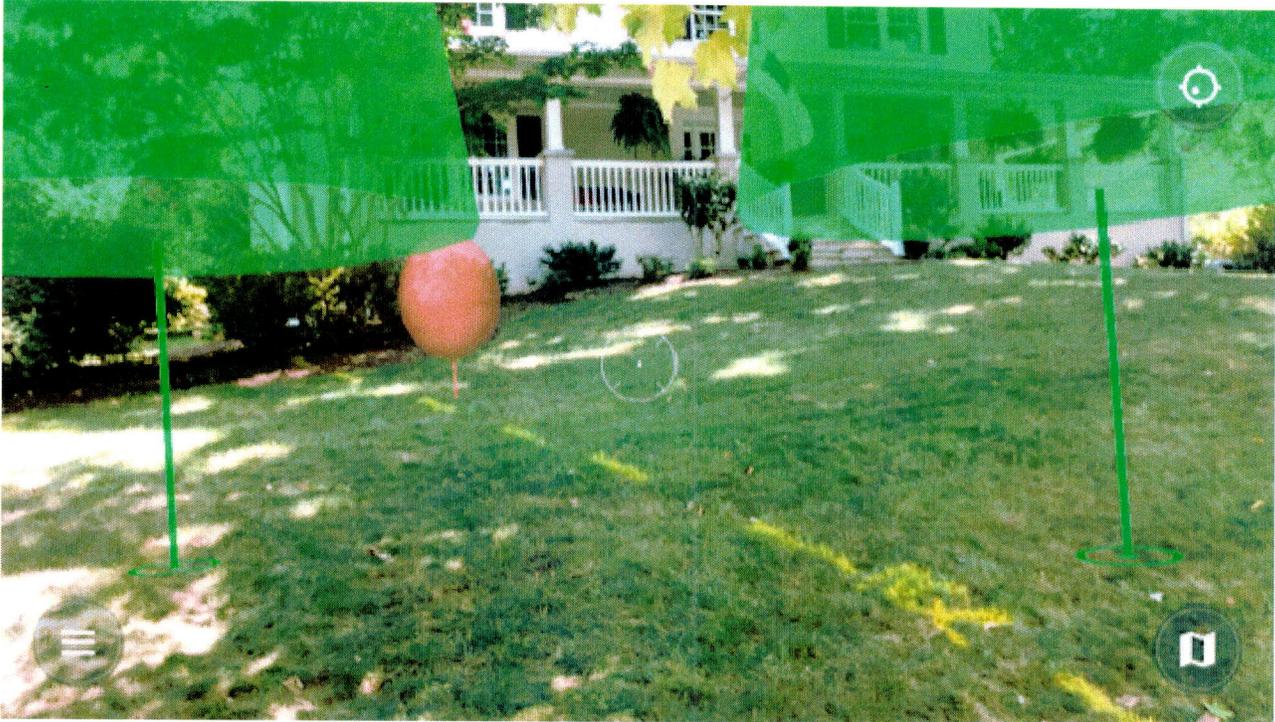
Capture locate mark-outs in the AR view

- Locator has a method to document the utility mark-outs and show their locations relative to each of the proposed work items identified in the ticket request from the excavator.

Value

- When the locator has completed their mark-out of the utilities, they will then be able to relaunch the AR view and capture an image of their mark-outs with the AR object superimposed to show the relative positioning of the work items and mark-outs.
- The locator will then be able to send the AR enhanced image via email to the member

utility or Locate Service Provider for their records. The below photos are of the Augmented Reality application during the proof of concept test:





Summary

The use of Augmented Reality (AR) provided a contextually rich visual communication channel that the excavator can utilize to ensure that the locator is better informed on the location and nature of the proposed work when on the dig site. This ability is provided by leveraging functionality in the existing web ticket request being deployed at Virginia 811 by using information that is already being provided by the excavator and making it available to the Augmented Reality software application. To render the AR experience, the locator was provided a link in the existing ticket notification that they can select when at the worksite, that launched the AR application installed on their mobile device. This same AR application allows the locate technician to capture an image of the locate mark-outs at the site with the AR imagery superimposed based on the information provided by the excavator via the web ticket request. This image will then be available to form part of the permanent record for that locate.

Quantifiable Metrics/Measures of Effectiveness (Item 2 under Article IX, Section 9.02 Final Report: “Where the output of the project can be quantified, a computation of the cost per unit of output.”)

The following companies participated in the proof of concept pilot project:

- Stake Center Locating
- Roanoke Gas
- UtiliQuest
- Save the Utilities
- Western Virginia Water Authority

All companies which participated in the proof of concept pilot project completed a survey afterwards. Below you will see each survey statement and the overall scores.:

Statement 1: The AR application was easy to use.

60% Agreed
40% Neither agreed or disagreed

Statement 2: The use of the AR application helped me to identify and understand the excavation area.

33.33% Strongly agreed
50% Agreed
16.67% Neither agreed or disagreed

Statement 3: The image comparing AR images and real world marking of utilities will enhance my manifest.

50% Strongly agreed
33.33% Agreed
16.67 Neither agreed or disagreed

Statement 4: Prior to today, I was familiar with AR and it uses in the gaming and/or construction industry.

16.67% Strongly Agreed
66.67% Agreed
16.67% Neither agreed or disagreed

Overall the participants felt the future of damage prevention can greatly increase with the use of augmented reality. As technology changes and the application can become more streamlined, the practically for everyday locate usability will increase.

Issues, Problems or Challenges (Item 3 under Article IX, Section 9.02 Final Report: “The reasons for slippage if established objectives were not met. “)

Virginia Utility Protection Service, Inc. discovered utilization of the camera Augmented Reality tools are cost prohibitive. We do anticipate with time that this functionality will go to open source code thus reducing price however, this will occur post-project and will not be included in this proof of concept pilot project.

Final Financial Status Report

Deliverable	Price	Object Class Category
Setup and configuration of the Augmented Reality Prostar Solution	\$25,000	Contractual
Requirements and gathering	\$25,000	Contractual
Execution and delivery of requirements	\$25,000	Contractual
Proof of Concept Pilot Project Testing	\$25,000	Contractual

See Appendix A – Final Financial Status Report for invoices and payments and SF 425.

Requests of the AOR and/or PHMSA

No actions requested at this time.

*Appendix A –
Final
Financial
Status Report
& Receipts*



ProStar GeoCorp, Inc.
760 Horizon Drive, Suite 200
Grand Junction, CO 81506
(970) 242-4024

Invoice

BILL TO

Virginia Utility Protection
Service, Inc.
1829 Blue Hills Circle, NE
Roanoke, VA 24012

INVOICE # 1422

DATE 03/12/2019

DUE DATE 03/12/2019

TERMS Due on receipt

DATE	DESCRIPTION	AMOUNT USD
03/12/2019	As per the Professional Services Agreement and SOW February 1, 2019	25,000.00

Phase I: Setup and configuration of the ProStar Solution to meet VA811 requirements

BANKING INFO for direct/electronic depositing:

ProStar GeoCorp, Inc.
routing #107002448
account #2600715166
(Bank of Colorado, 200 Grand Avenue, Grand Junction, CO 81501)

BALANCE DUE

\$25,000.00

Acct #	<u>1201</u>	Dept.	<u>IT</u>
Desor	<u>Payment 1 of 4 for AR</u>		
	<u>Software (GRANT)</u>		
Amt	<u>25,000⁰⁰</u>	Apprv	<u>[Signature]</u>
Accounting Use:			
Check #			Date



Virginia Utility Protection Service, Inc.
1829 Blue Hills Circle N.E.
Roanoke, VA 24012

WELLS FARGO BANK, N.A.
www.wellsfargo.com
68-54/514

16086

3/21/2019

PAY TO THE ORDER OF ProStar GeoCorp, Inc.

\$ **25,000.00

Twenty-Five Thousand and 00/100*****

DOLLARS

ProStar GeoCorp, Inc.
760 Horizon Drive, Suite 200
Grand Junction, CO 81506

AUTHORIZED SIGNATURE

MEMO

Inv #1422; Pmt 1 of 4 for AR Software Grant

⑈0000016086⑈ ⑆051400549⑆ 2000015276458⑈

SERVICE, INC. VIRGINIA UTILITY PROTECTION SERVICE INC

16086

ProStar GeoCorp, Inc.

Date	Type	Reference	Original Amt	Balance Due	3/21/2019 Discount	Payment
3/12/2019	Bill	1422	25,000.00	25,000.00		25,000.00
					Check Amount	25,000.00

Wells Fargo Checking Inv #1422; Pmt 1 of 4 for AR Software Grant 25,000.00

SERVICE, INC. VIRGINIA UTILITY PROTECTION SERVICE INC

16086

ProStar GeoCorp, Inc.

Date	Type	Reference	Original Amt	Balance Due	3/21/2019 Discount	Payment
3/12/2019	Bill	1422	25,000.00	25,000.00		25,000.00
					Check Amount	25,000.00

Wells Fargo Checking Inv #1422; Pmt 1 of 4 for AR Software Grant 25,000.00



ProStar GeoCorp, Inc.
760 Horizon Drive, Suite 200
Grand Junction, CO 81506
(970) 242-4024

Invoice

BILL TO

Virginia Utility Protection
Service, Inc.
1829 Blue Hills Circle, NE
Roanoke, VA 24012

INVOICE # 1427
DATE 03/21/2019
DUE DATE 03/21/2019
TERMS Due on receipt

DATE	DESCRIPTION	AMOUNT USD
03/21/2019	As per the Professional Services Agreement and SOW February 1, 2019	25,000.00

Phase II: Requirements gathering to complete work to date and confirm VA811 project requirements

BANKING INFO for direct/electronic depositing:

ProStar GeoCorp, Inc.
routing #107002448
account #2600715166
(Bank of Colorado, 200 Grand Avenue, Grand Junction, CO 81501)

BALANCE DUE **\$25,000.00**

Acct # 1201 Dept. IS
Descr PAYMENT 2 of 4 for
AR Software
Amt 25,000.00 APPN (Koghaner)
Accounting Use:
Check # _____ Date _____



Virginia Utility Protection Service, Inc.
1829 Blue Hills Circle N.E.
Roanoke, VA 24012

WELLS FARGO BANK, N.A.
www.wellsfargo.com
68-54/514

16089

3/21/2019

PAY TO THE ORDER OF ProStar GeoCorp, Inc.

\$ **25,000.00

Twenty-Five Thousand and 00/100***** DOLLARS

ProStar GeoCorp, Inc.
760 Horizon Drive, Suite 200
Grand Junction, CO 81506

[Handwritten Signature]
AUTHORIZED SIGNATURE

MEMO
Inv #1427; Pmt 2 of 4 for AR Software Grant

⑈0000016089⑈ ⑆051400549⑆ 2000015276458⑈

SERVICE, INC. VIRGINIA UTILITY PROTECTION SERVICE INC

16089

ProStar GeoCorp, Inc.

Date	Type	Reference	Original Amt.	Balance Due	3/21/2019 Discount	Payment
3/21/2019	Bill	1427	25,000.00	25,000.00		25,000.00
					Check Amount	25,000.00

Wells Fargo Checking Inv #1427; Pmt 2 of 4 for AR Software Grant 25,000.00

SERVICE, INC. VIRGINIA UTILITY PROTECTION SERVICE INC

16089

ProStar GeoCorp, Inc.

Date	Type	Reference	Original Amt.	Balance Due	3/21/2019 Discount	Payment
3/21/2019	Bill	1427	25,000.00	25,000.00		25,000.00
					Check Amount	25,000.00

Wells Fargo Checking Inv #1427; Pmt 2 of 4 for AR Software Grant 25,000.00



ProStar GeoCorp, Inc.
 760 Horizon Drive, Suite 200
 Grand Junction, CO 81506
 (970) 242-4024

Invoice

BILL TO

Virginia Utility Protection
 Service, Inc.
 1829 Blue Hills Circle, NE
 Roanoke, VA 24012

INVOICE # 1442
 DATE 07/17/2019
 DUE DATE 07/17/2019
 TERMS Due on receipt

DATE	DESCRIPTION	
07/17/2019	As per the Professional Services Agreement and SOW February 1, 2019	25,000.00

Phase III. Build, test and deliver a mobile application, compatible with most mobile devices (to be used in conjunction with the ticket entry user interface as provided by ProStar to VA811) Proof of Concept functions

BANKING INFO for direct/electronic depositing:
 ProStar GeoCorp, Inc.
 routing #107002448
 account #2600715166
 (Bank of Colorado, 200 Grand Avenue, Grand Junction, CO 81501)

BALANCE DUE **\$25,000.00**

Acct # 1201 Dept. IT
 Descr _____
PAYMENT 3 of 4 For AR
GRANT
 Amt 25,000.00 Apprv [Signature]
 Accounting Use _____
 Check # 10378 Date 7/16/19



Virginia Utility Protection Service, Inc.
1829 Blue Hills Circle N.E.
Roanoke, VA 24012

WELLS FARGO BANK, N.A.
www.wellsfargo.com
68-54/514

16378

7/18/2019

PAY TO THE ORDER OF ProStar GeoCorp, Inc.

\$*25,000.00

Twenty Five Thousand and 00/100

DOLLARS

ProStar GeoCorp, Inc.
760 Horizon Drive, Suite 200
Grand Junction, CO 81506



Rich Leland
AUTHORIZED SIGNATURE

MEMO

Inv #1442, Pmt 3 of 4 for AR Software Grant

⑈0000016378⑈ ⑆05⑆400549⑆ 2000015276458⑈

SERVICE INC VIRGINIA UTILITY PROTECTION SERVICE INC

16378

Date	Type	Reference	Original Amt	Balance Due	7/18/2019 Discount	Payment
7/17/2019	Bill	1442	25,000.00	25,000.00		25,000.00
					Check Amount	25,000.00

Wells Fargo Checking Inv #1442, Pmt 3 of 4 for AR Software Grant

25,000.00

Details on Back Security Features Included



ProStar GeoCorp, Inc.
 760 Horizon Drive, Suite 200
 Grand Junction, CO 81506
 (970) 242-4024

Invoice

BILL TO

Virginia Utility Protection
 Service, Inc.
 1829 Blue Hills Circle, NE
 Roanoke, VA 24012

INVOICE # 1446

DATE 08/09/2019

DUE DATE 08/09/2019

TERMS Due on receipt

DATE	DESCRIPTION	AMOUNT
08/09/2019	As per the Augmented Reality (AR) Proof of Concept Agreement and SOW February 1, 2019	25,000.00

Phase IV: Pilot user acceptance testing

BANKING INFO for direct/electronic depositing:

ProStar GeoCorp, Inc.
 routing #107002448
 account #2600715166
 (Bank of Colorado, 200 Grand Avenue, Grand Junction, CO 81501)

BALANCE DUE

\$25,000.00

Acct # 1201 Dept. IT
 Descr PAYMENT 4 of 4 for AR PROJECT
 Amt 25,000.00 Apprv S. Hoglauer
 Accounting Use:
 Check # 16456 Date 8/15/19



Virginia Utility Protection Service, Inc.
1829 Blue Hills Circle N.E.
Roanoke, VA 24012

WELLS FARGO BANK, N.A.
www.wellsfargo.com
68-54/514

16456

8/15/2019

PAY TO THE ORDER OF ProStar GeoCorp, Inc.

\$25,000 00

Twenty-Five Thousand and 00/100*****

DOLLARS

ProStar GeoCorp, Inc.
760 Horizon Drive, Suite 200
Grand Junction, CO 81506



Rich Howard

AUTHORIZED SIGNATURE

MEMO

Inv #1446: Pmt 4 of 4 for AR Software Grant

⑈0000016456⑈ ⑆051400549⑆ 2000015276458⑈

SERVICE INC VIRGINIA UTILITY PROTECTION SERVICE INC

16456

Date	Type	Reference	Original Amt	Balance Due	8/15/2019 Discount	Payment
8/9/2019	Bill	1446	25,000 00	25,000.00		25,000 00
					Check Amount	25,000 00

Wells Fargo Checking Inv #1446; Pmt 4 of 4 for AR Software Grant

25,000 00

Details on Back

Security Features Included