

TUTORIAL GEO EPANET

- Elaborando um modelo hidráulico utilizando a ferramenta QGIS e os complementos QgisRed, Closest Point e Line Around Points
- Tutorial elaborado por Anderson da Silva Martins

CRÉDITOS

- QGIS – Desenvolvedores e comunidade
- Plugin Closest Point (experimental) - Autor Jean-Christophe BAUDIN
- Plugin Lines Around Point (experimental) - Autor Andres Herrera
- Tutorial do plugin QEPANET (EMBASA) – Helder Aragão

O OBJETIVO DO TUTORIAL É APRESENTAR O PASSO A PASSO DA MINHA PESQUISA DE COMO ELABORAR UM MODELO HIDRÁULICO DO EPANET UTILIZANDO A PLATAFORMA DE GEOPROCESSAMENTO QGIS, E OS PLUGINS QGISRED, CLOSEST POINT E LINE AROUND POINTS, ALÉM DE DIVERSAS FERRAMENTAS NATIVAS DO QGIS.

A PARTIR DA METODOLOGIA DESENVOLVIDA É POSSÍVEL ELABORAR UM MODELO HIDRÁULICO COMPLETO DE UMA CIDADE EM POUCO TEMPO.

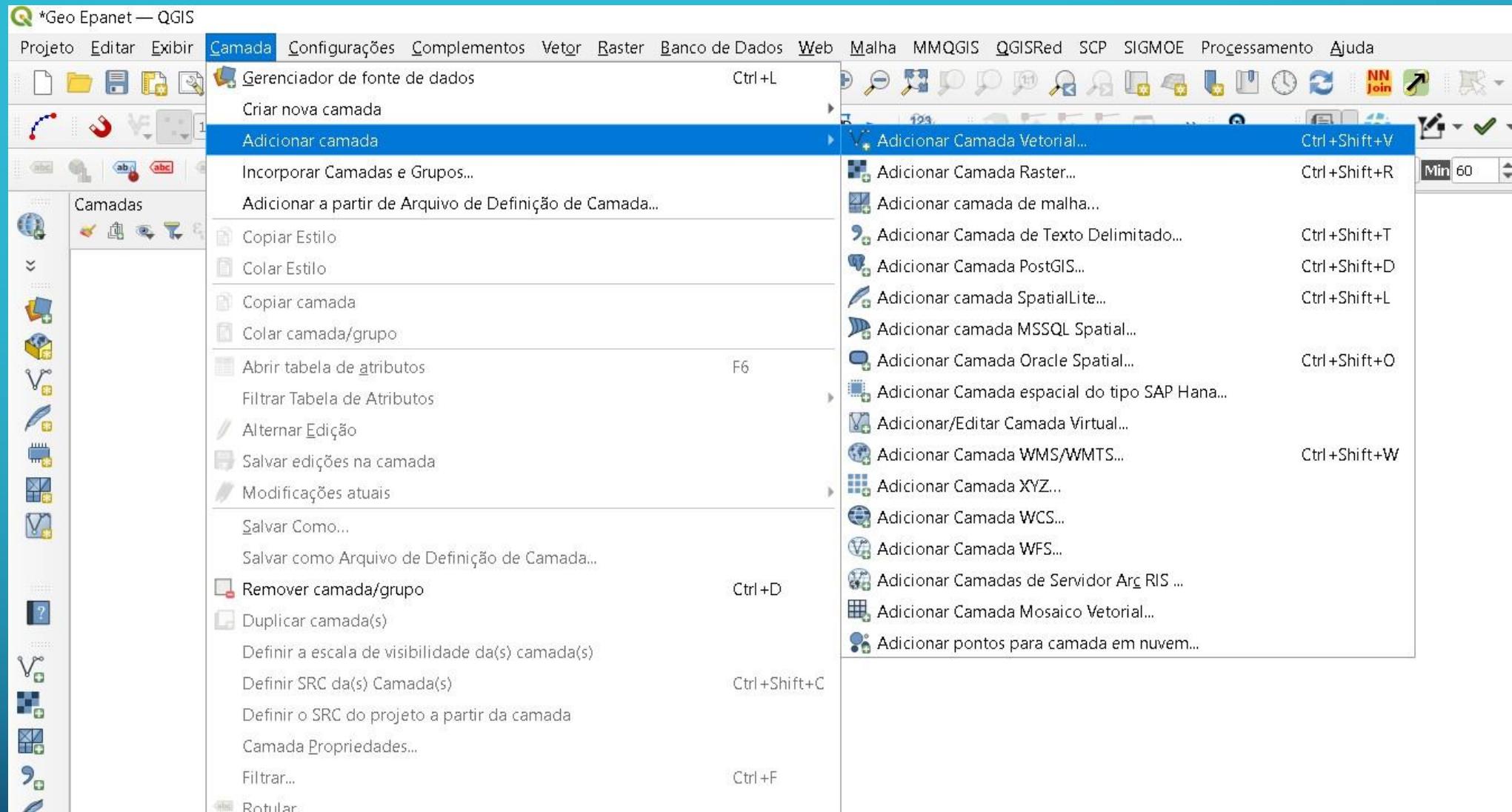


Figura 1 - Clicar no menu camada -> Adicionar camada -> Adicionar camada vetorial

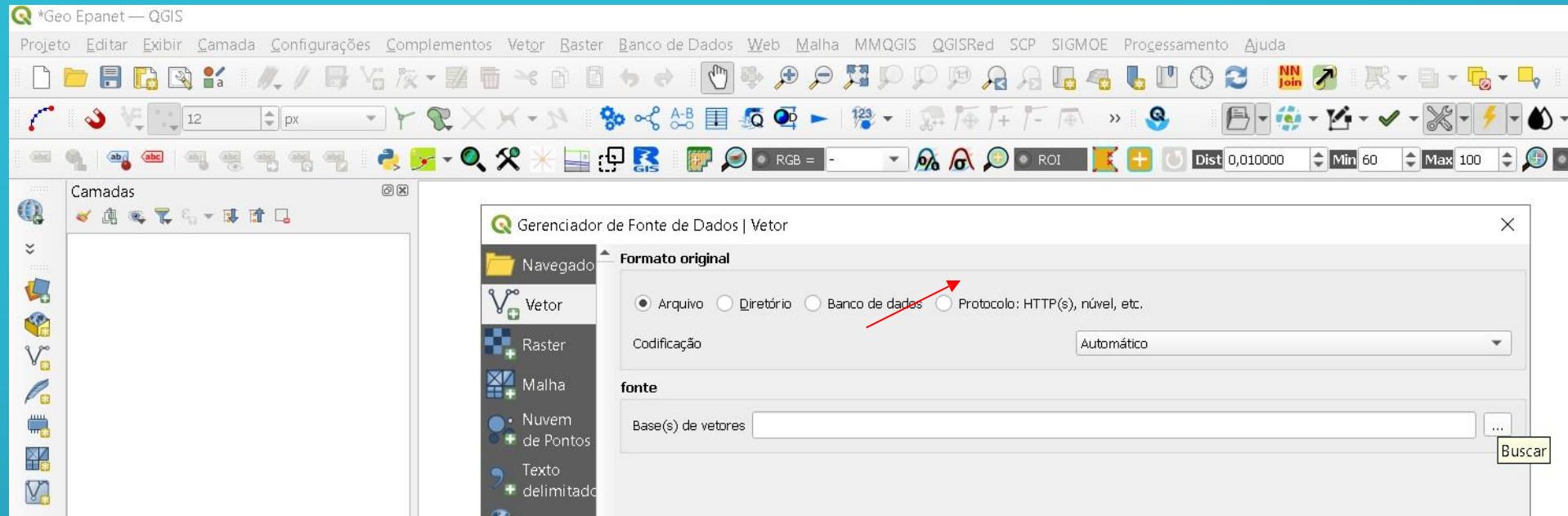


FIGURA 2 - CLICAR NO BOTÃO BUSCAR

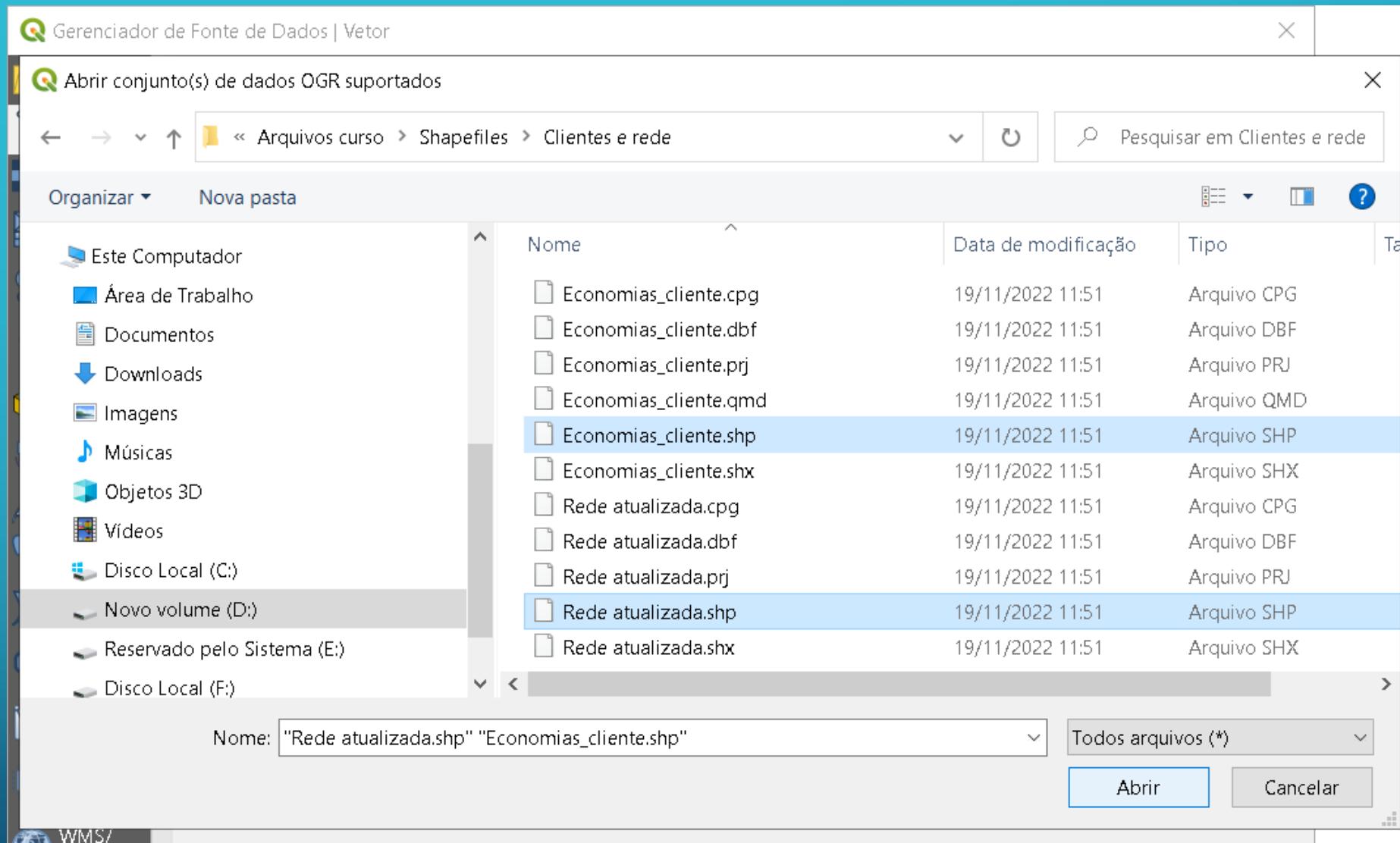


Figura 3 - Selecionar os arquivos .SHP e clicar em abrir

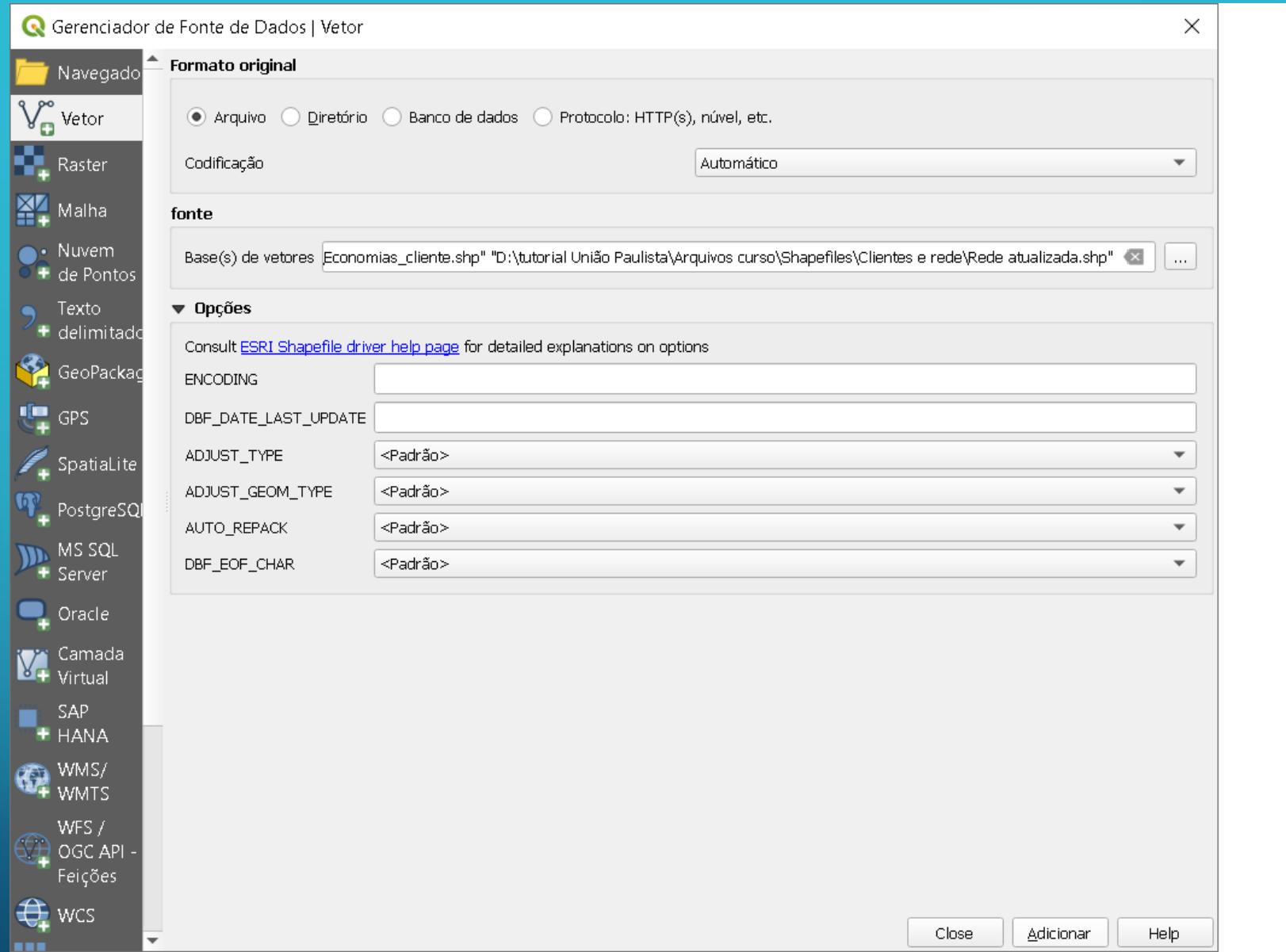


Figura 4 - clicar em adicionar e depois em close

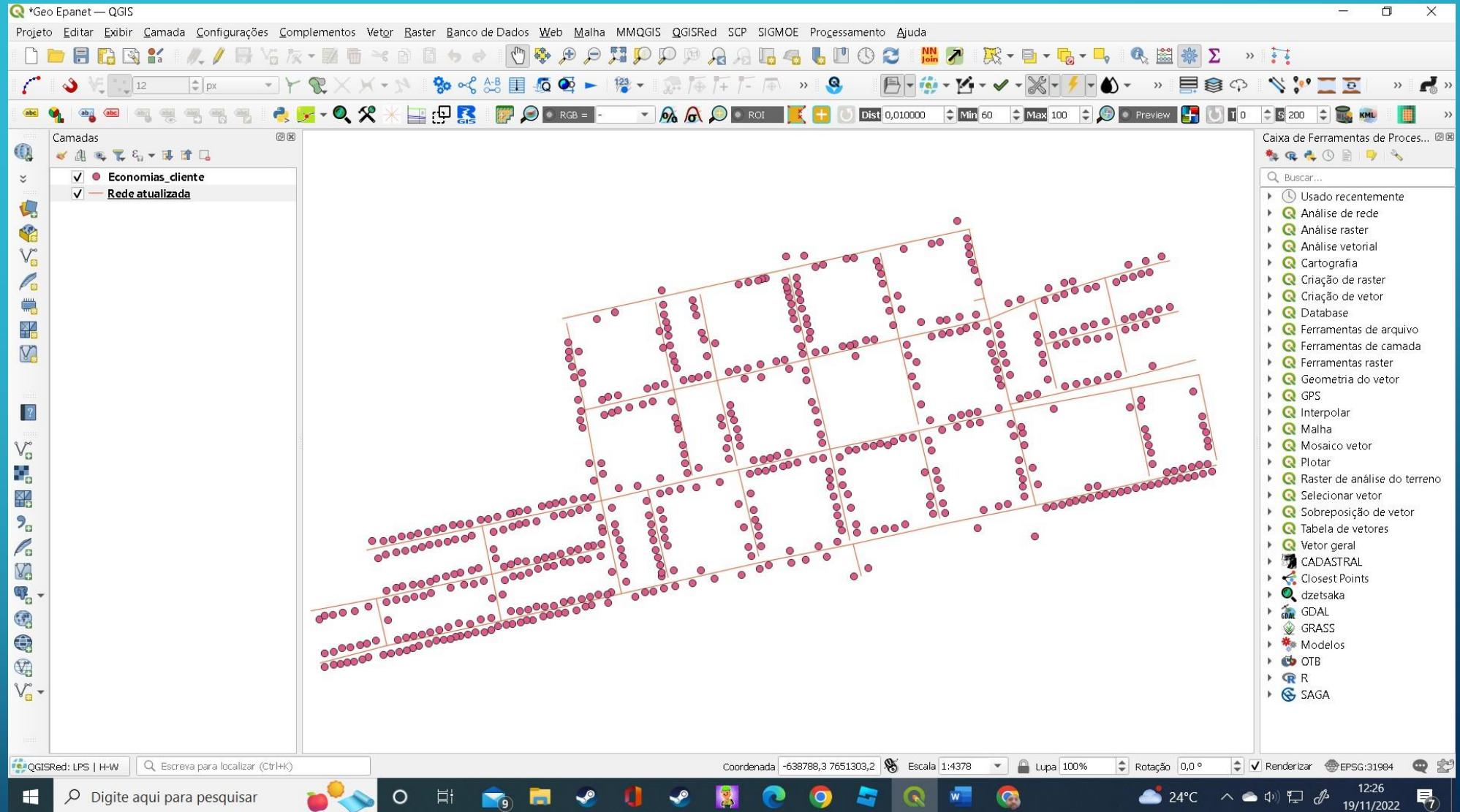


Figura 5 - as camadas serão exibidas na tela conforme a imagem

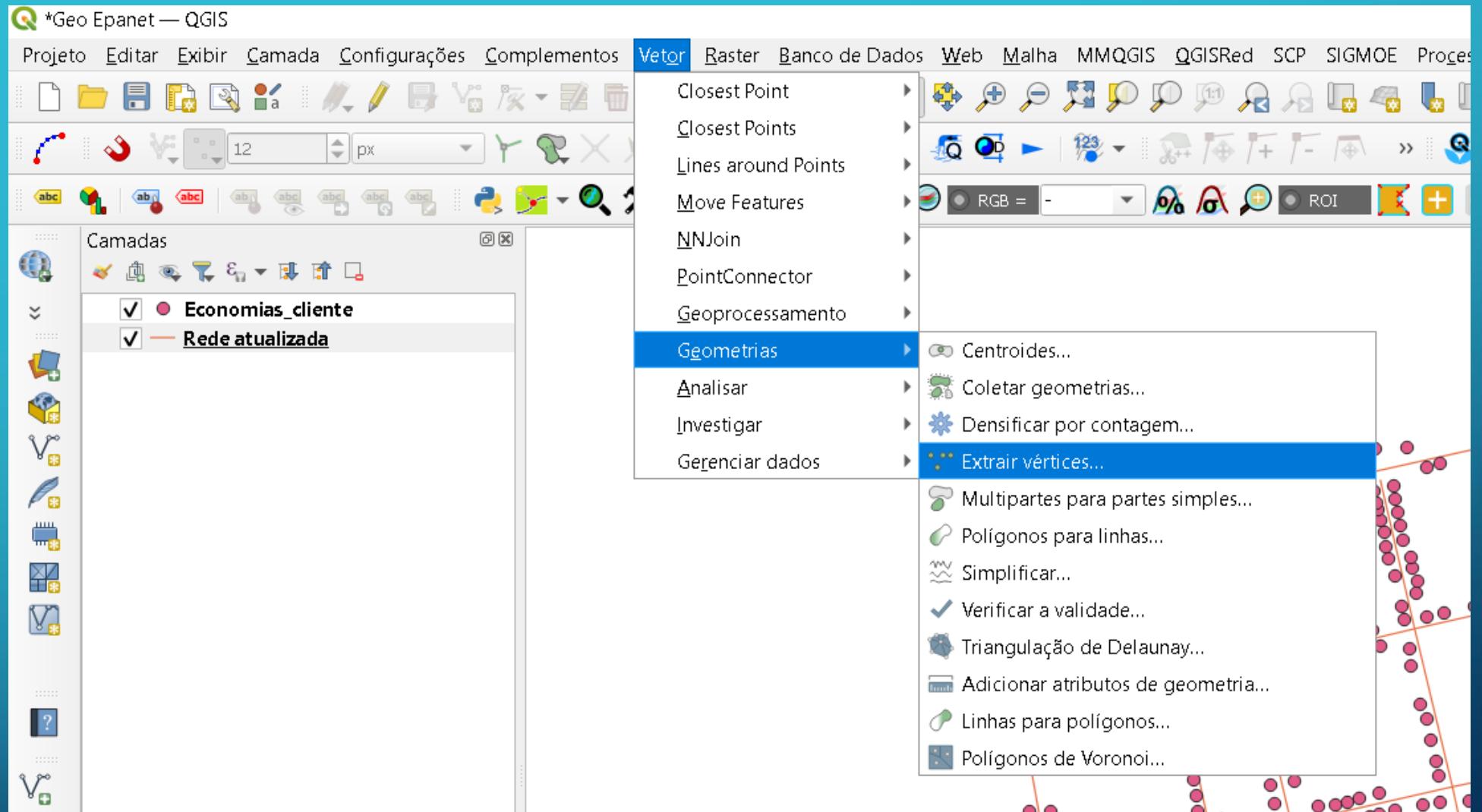


Figura 6 - Rodar o comando: *Vetor -> Geometrias -> Extrair vertices...*

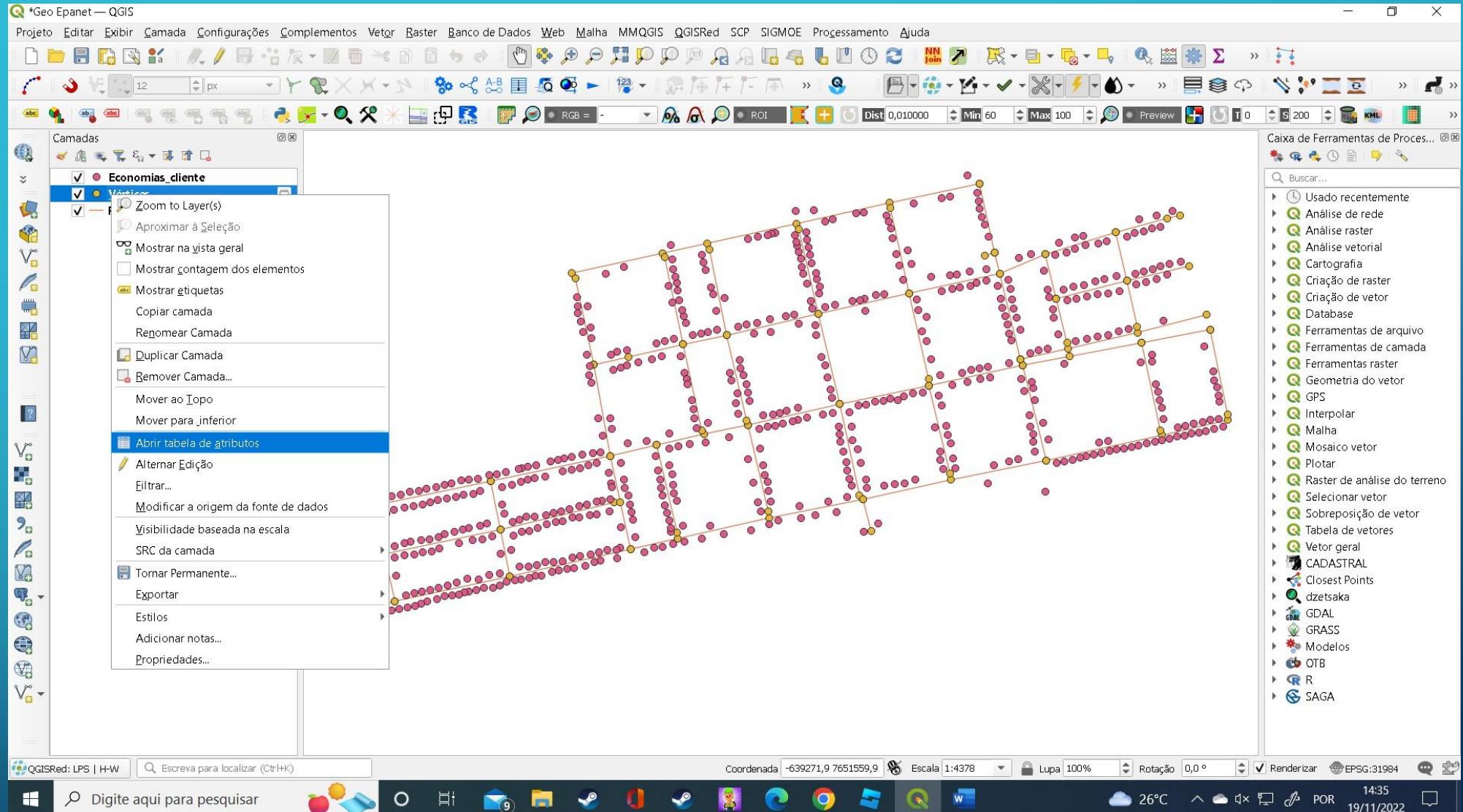


Figura 7 - Botão direito na camada "vertice" -> Abrir tabela de atributos

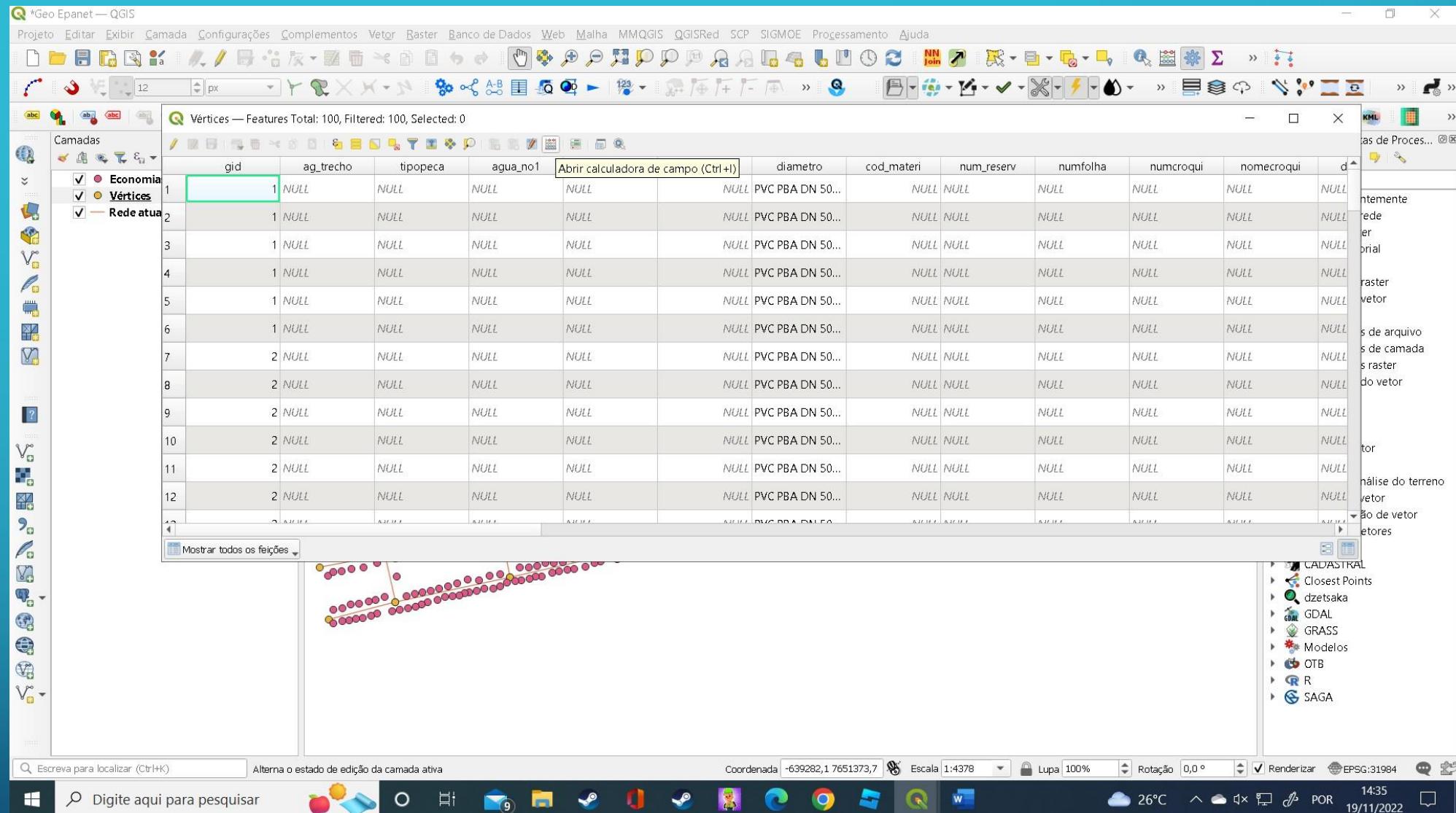


Figura 8- Clicar no Botão "Abrir Calculadora de campo"

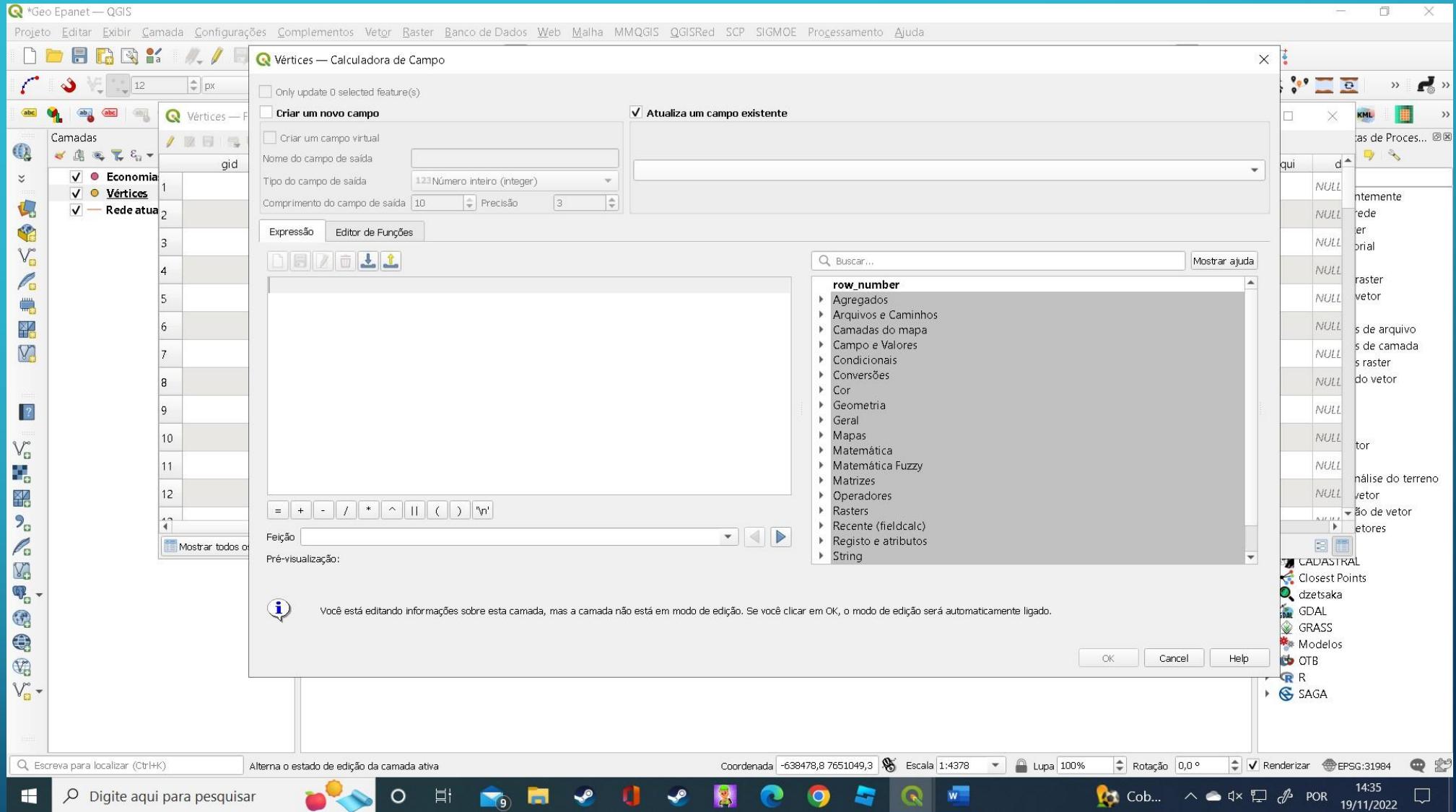


Figura 9 - Marcar o "flag Atualiza campo existente"

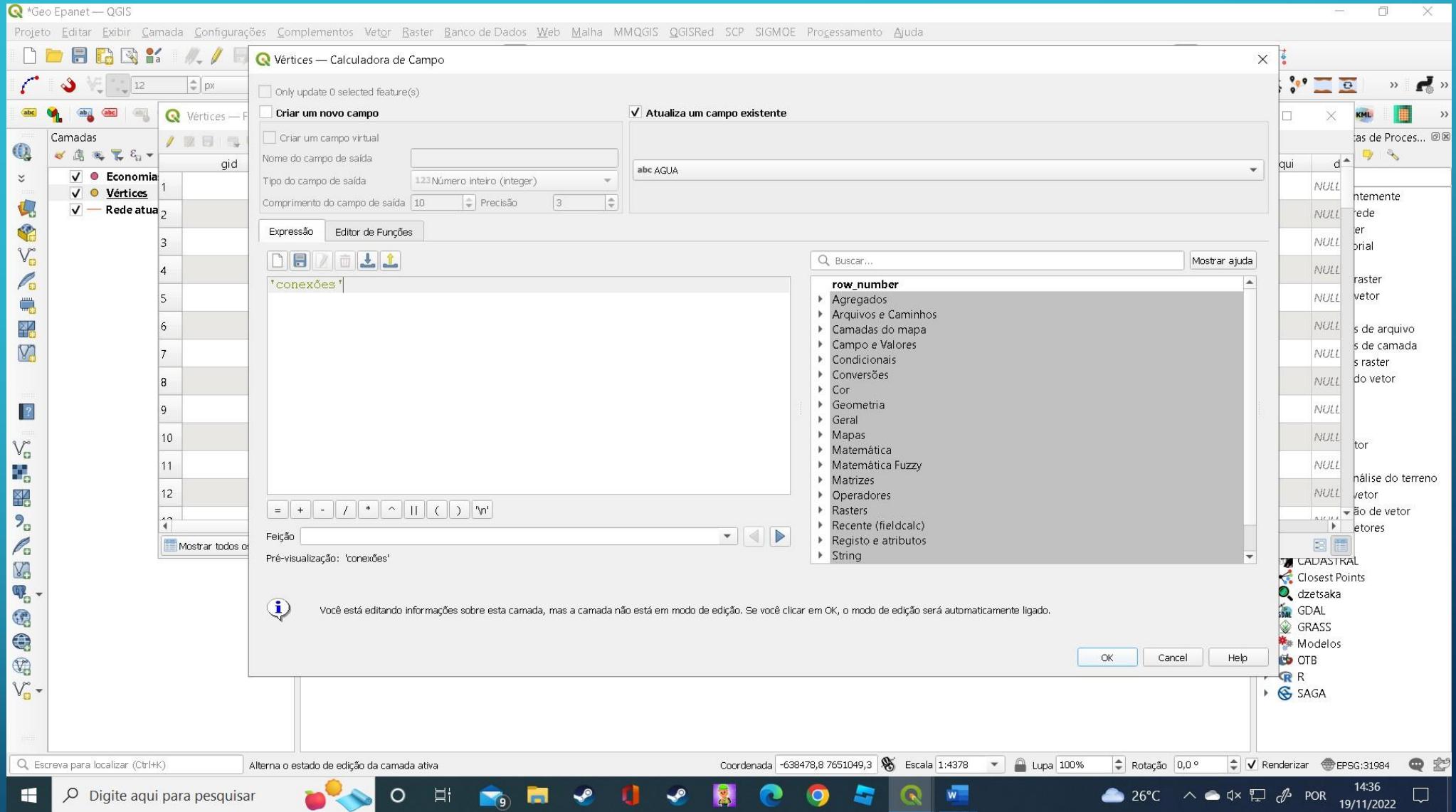


Figura 10 Selecionar o campo "AGUA" -> no campo expressões digitar: 'conexões' -> clicar no botão OK

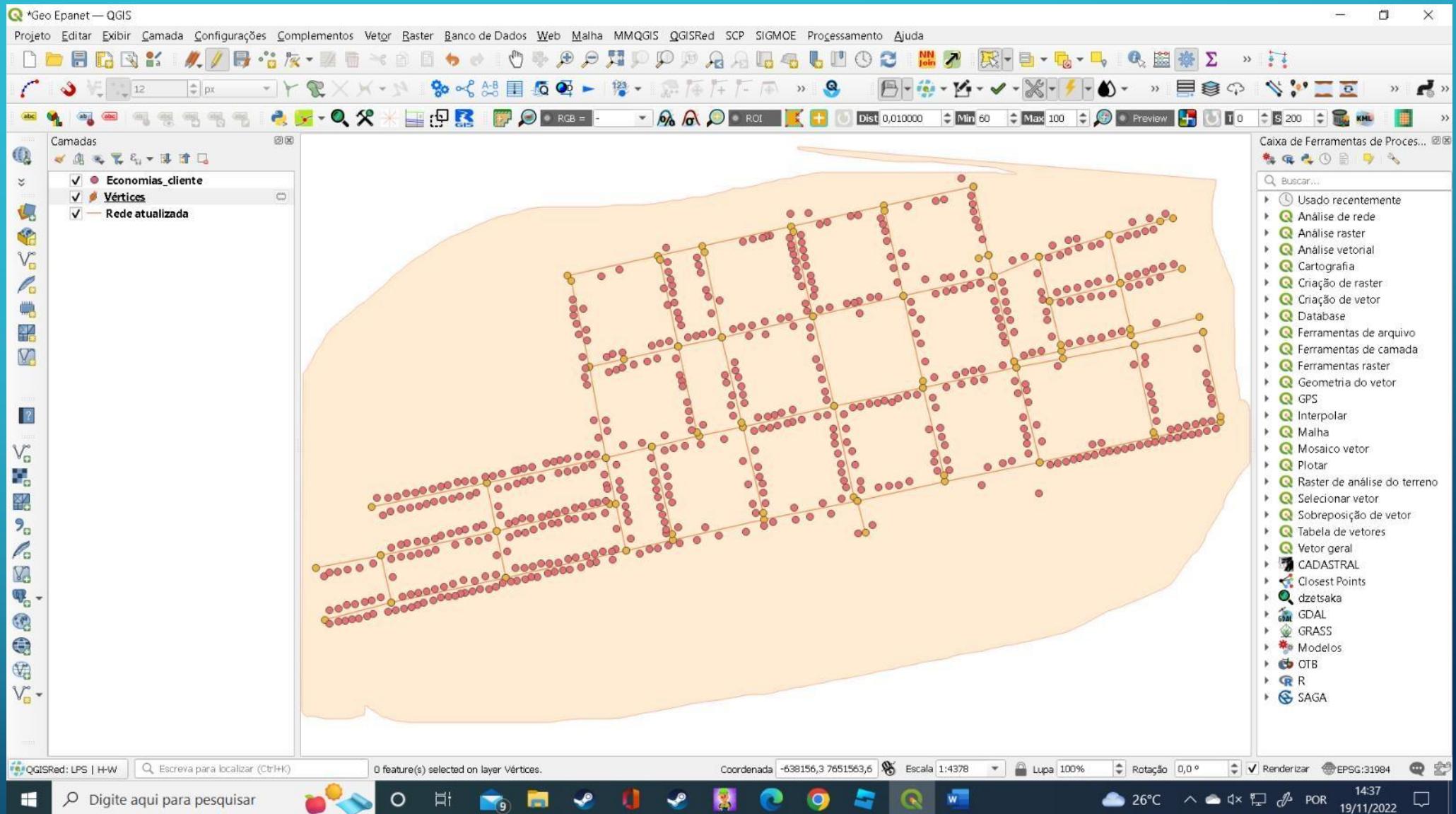


Figura 11 - Clicar na ferramenta de seleção e selecionar todos os pontos da camada "Vertices"

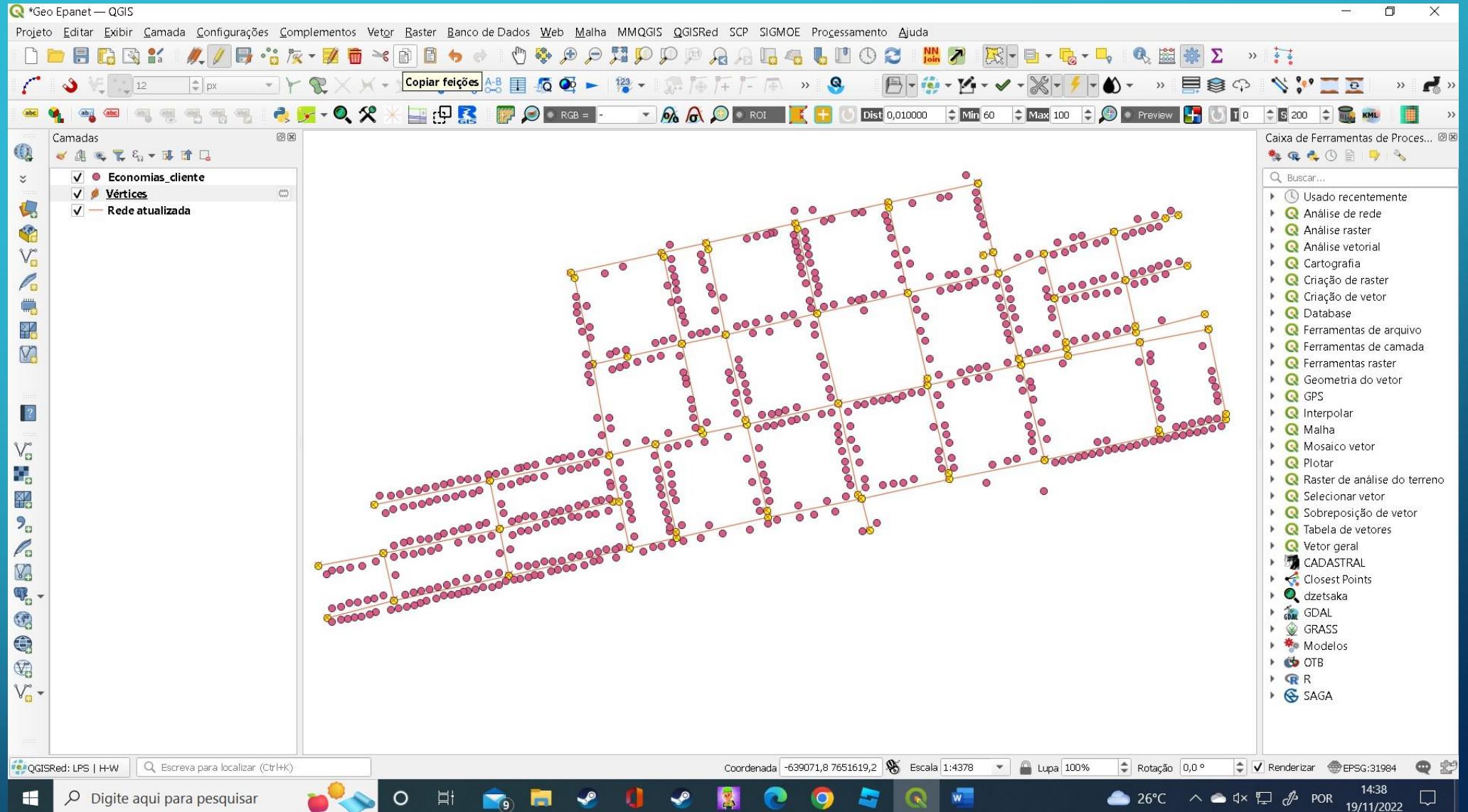


Figura 12 - Clicar no botão copiar feições

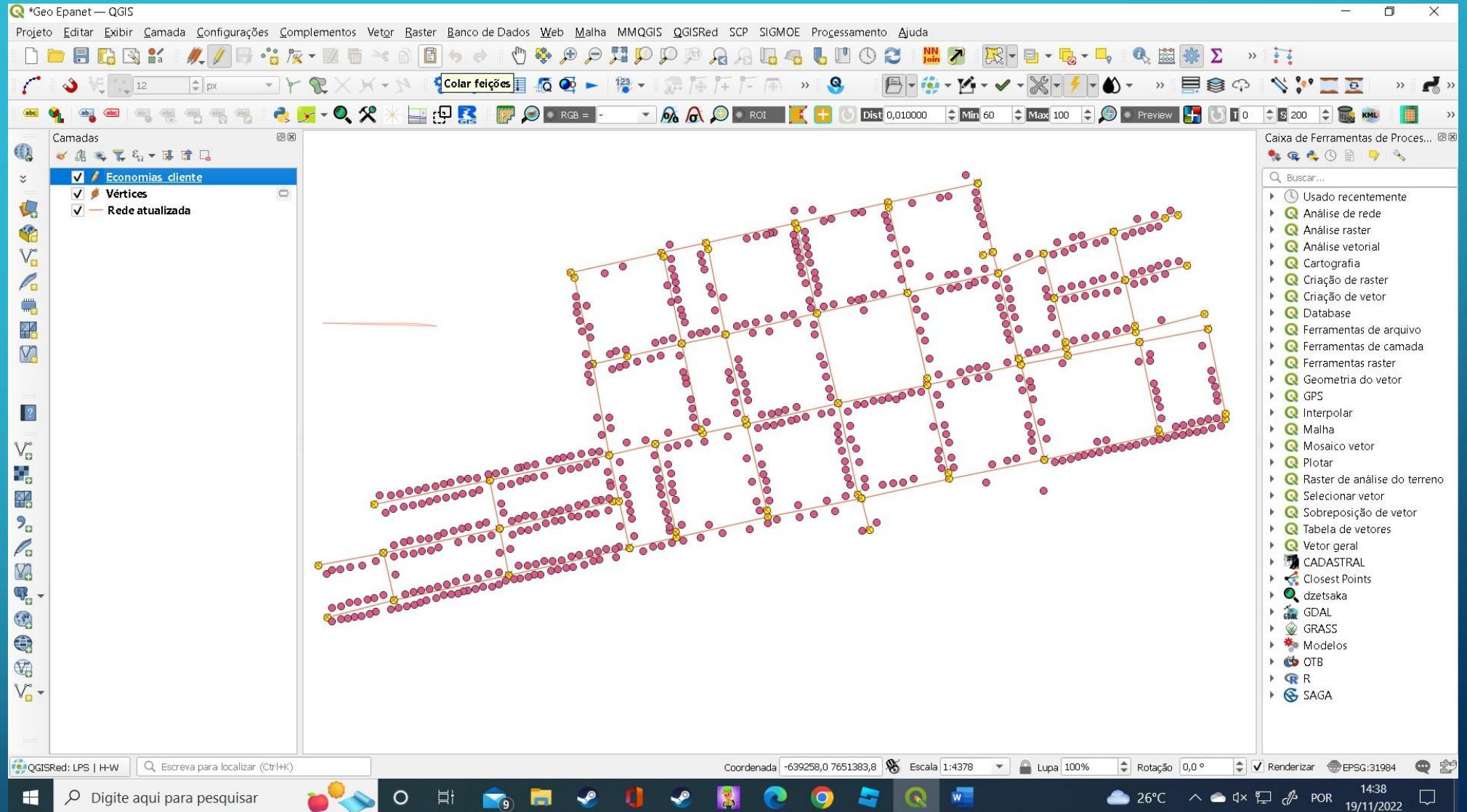


Figura 13- Clicar na camada Economias_cliente -> clicar no lápis para editar -> clicar no botão "colar feições"

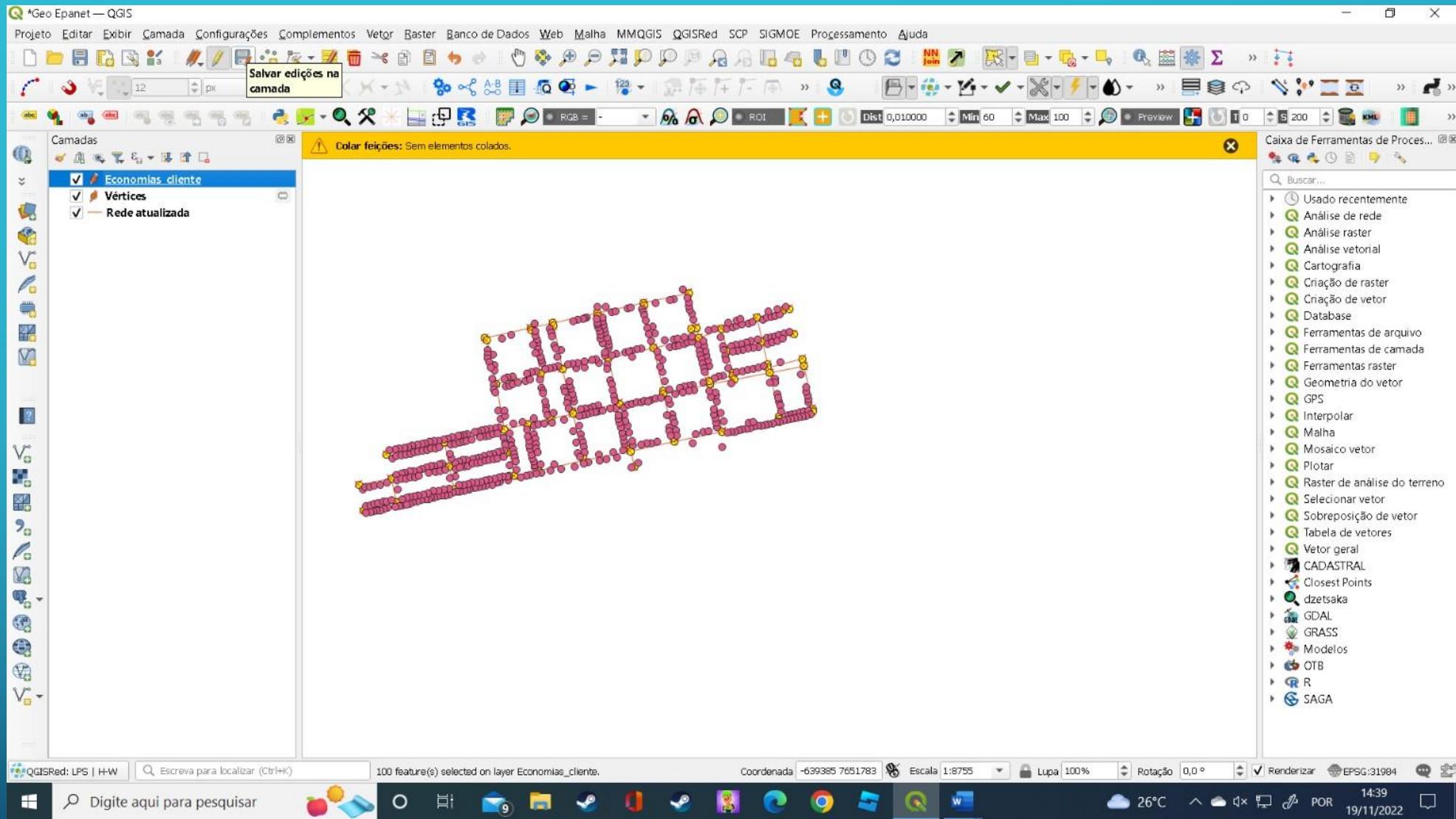


Figura 14 - Clicar no botão "Salvar edições na camada"

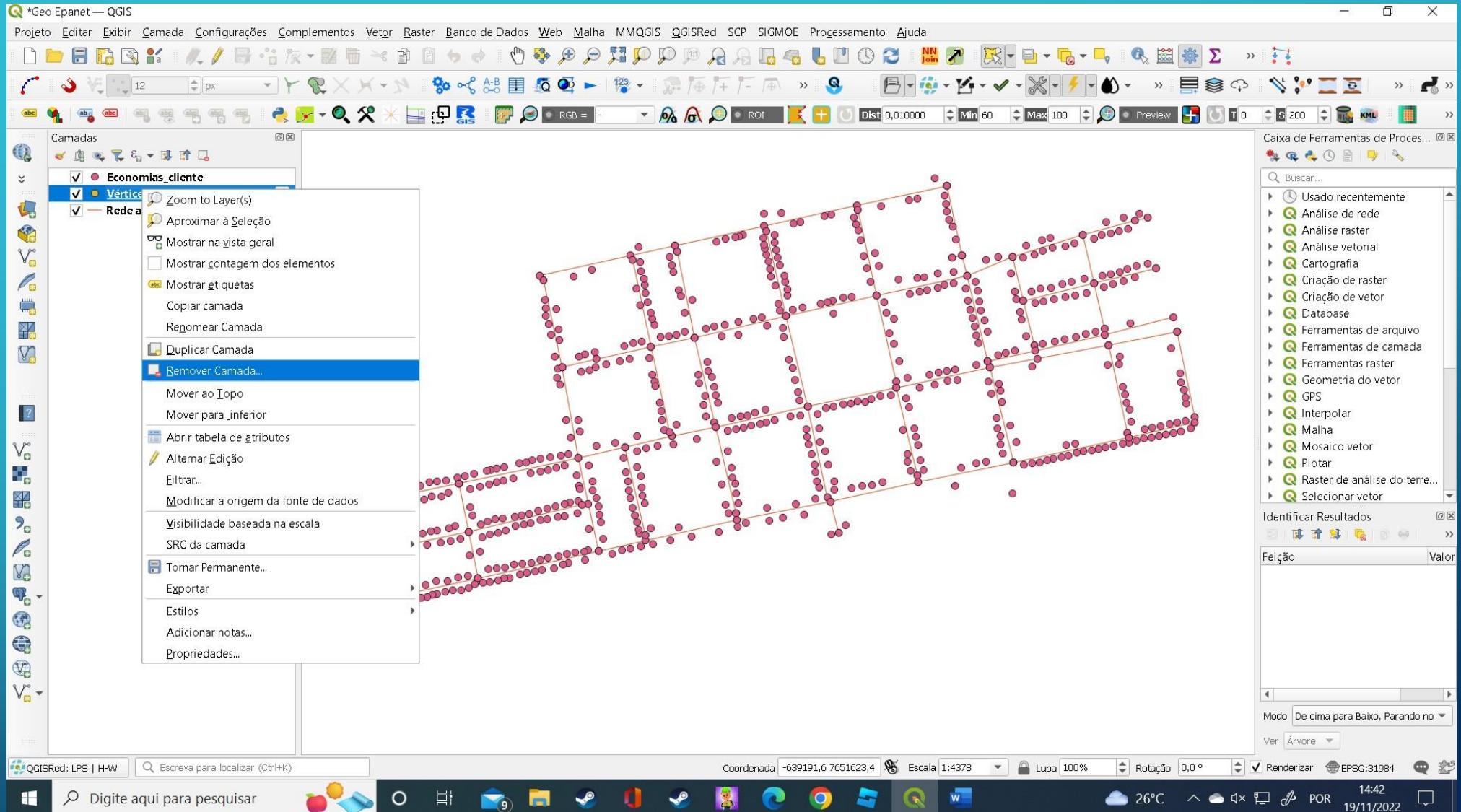


Figura 15 - Selecionar a camada "Vertices" com o botão direito e em "remover camada..."

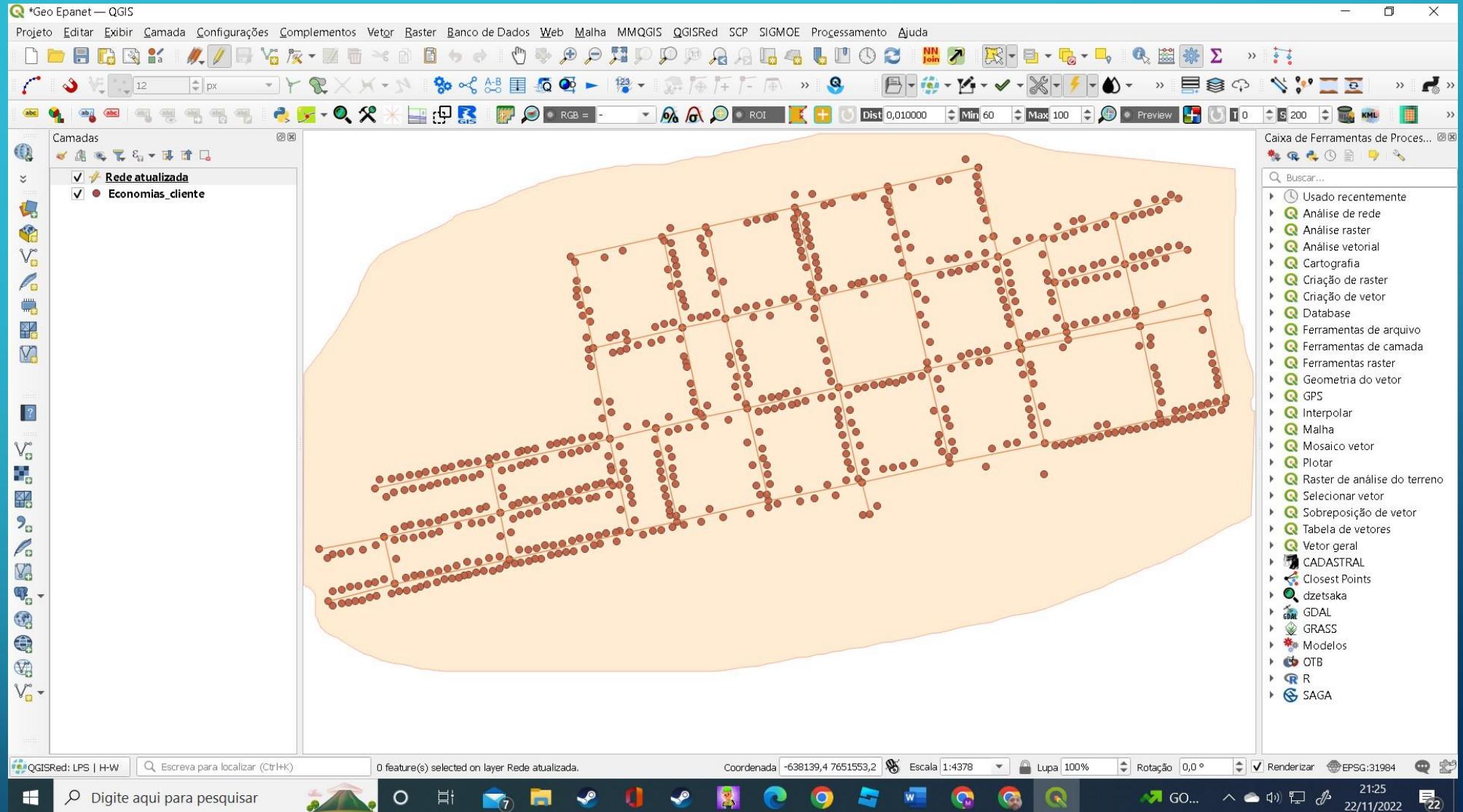


Figura 16 - Editar a camada "Rede_atualizada" e selecionar todas as feições

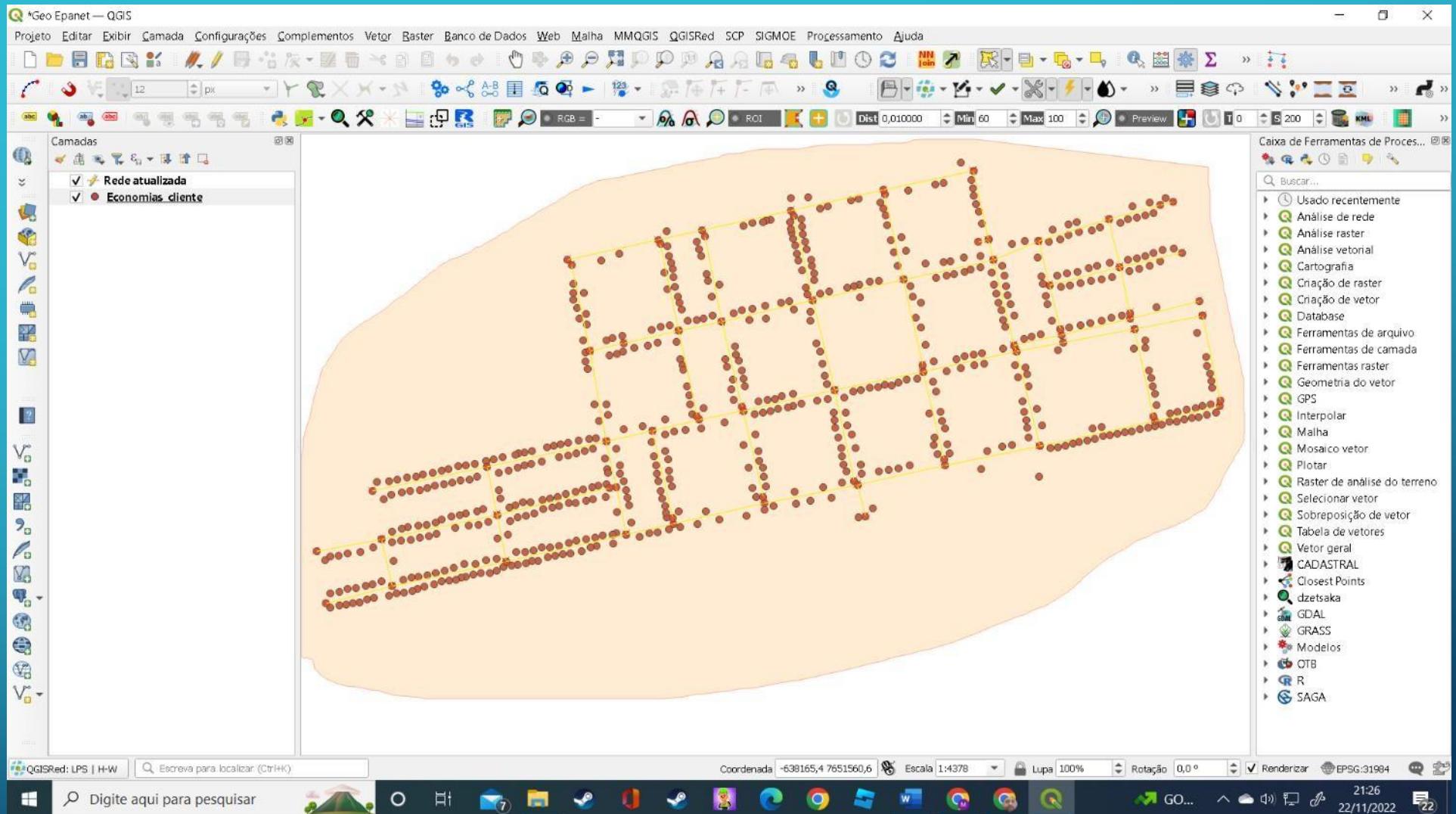


Figura 17- Editar a camada "Economias_cliente" e selecionar todas as feições

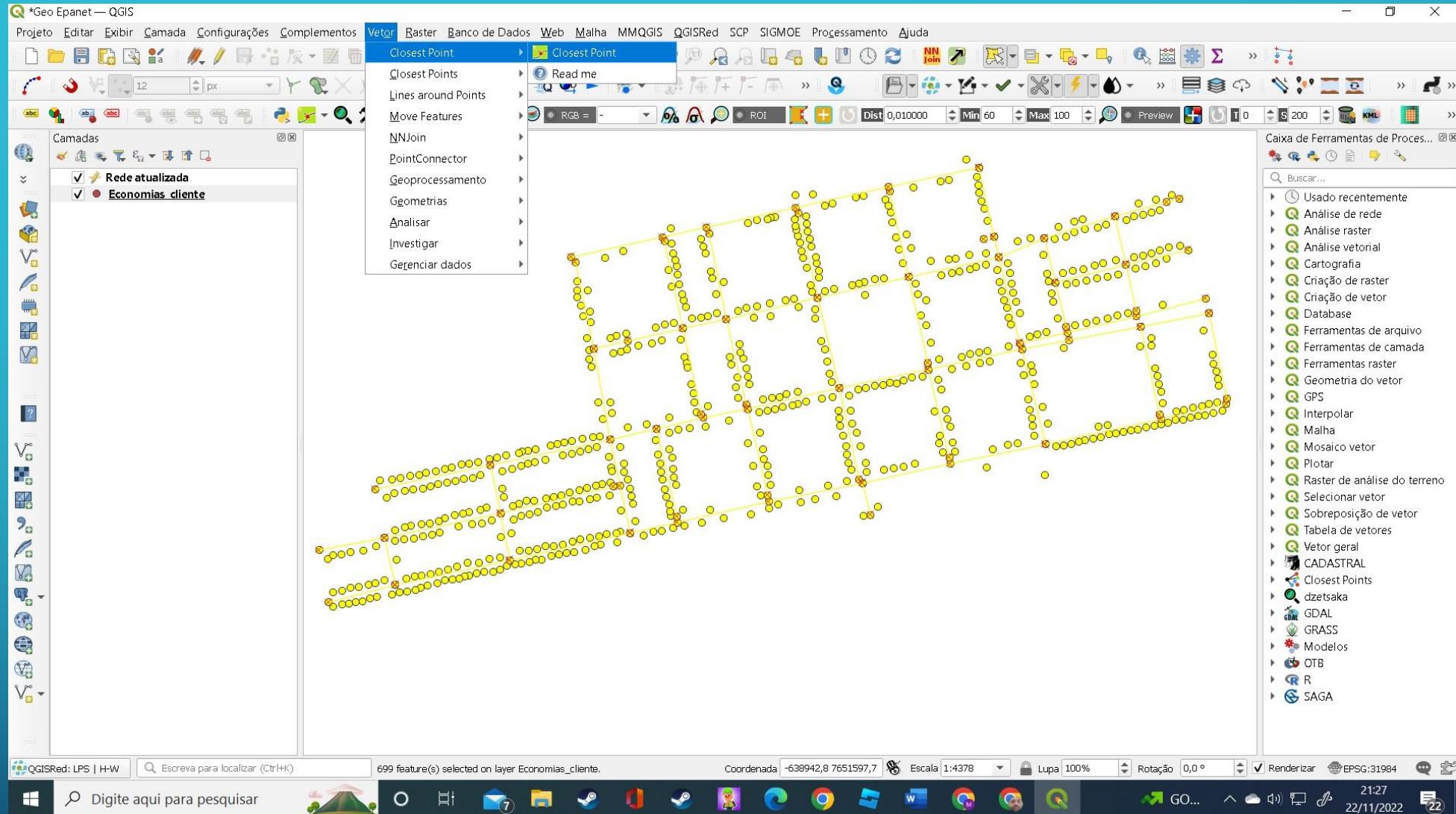


Figura 18- Clicar no menu "Vetor" -> "Complemento Closest Point"

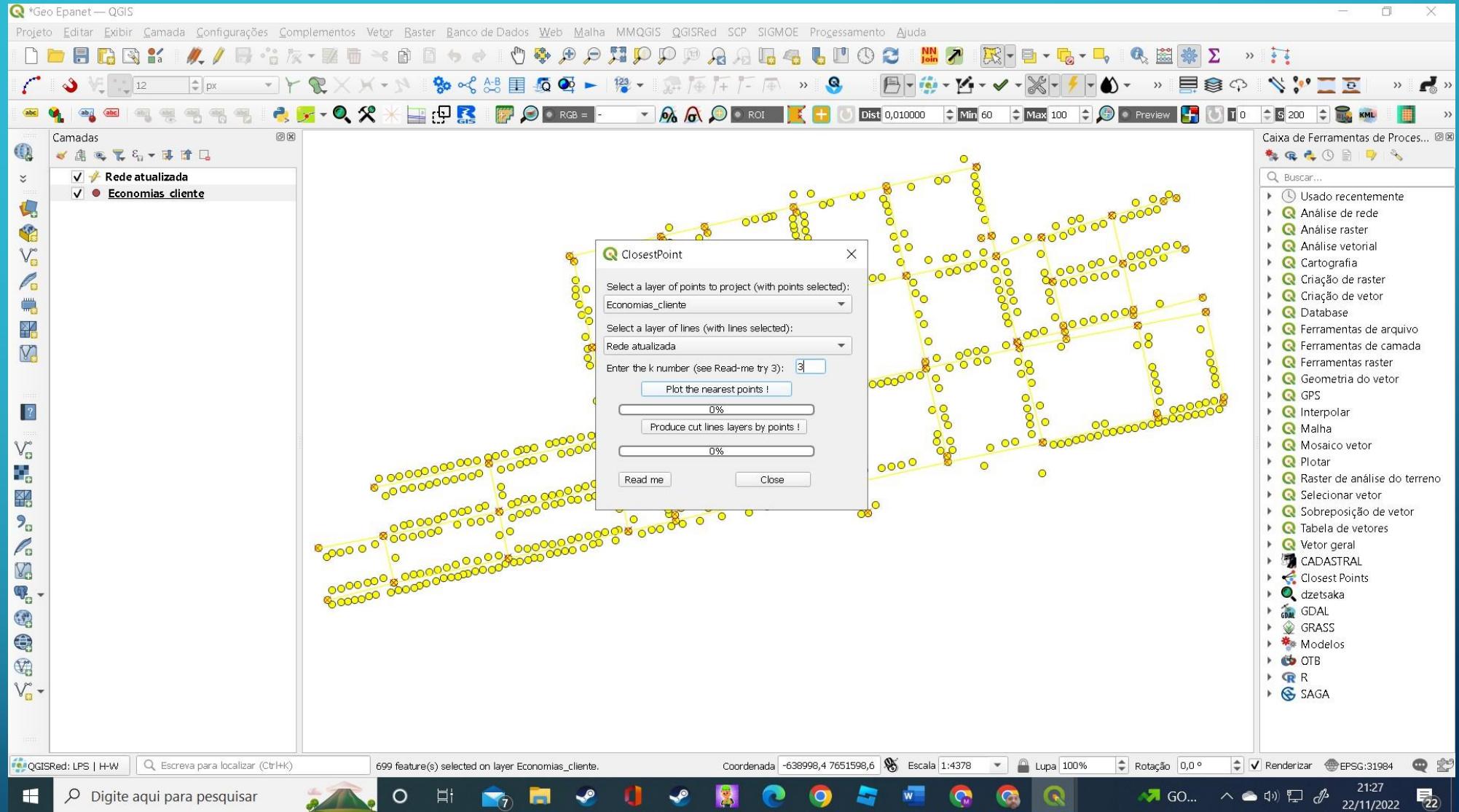


Figura 19 - Selecionar a camada "Economias_cliente" -> após selecionar a camada "rede_atualizada" -> Digitar 3 para o "K number" e por fim clicar no botão "Plot the nearest points!"

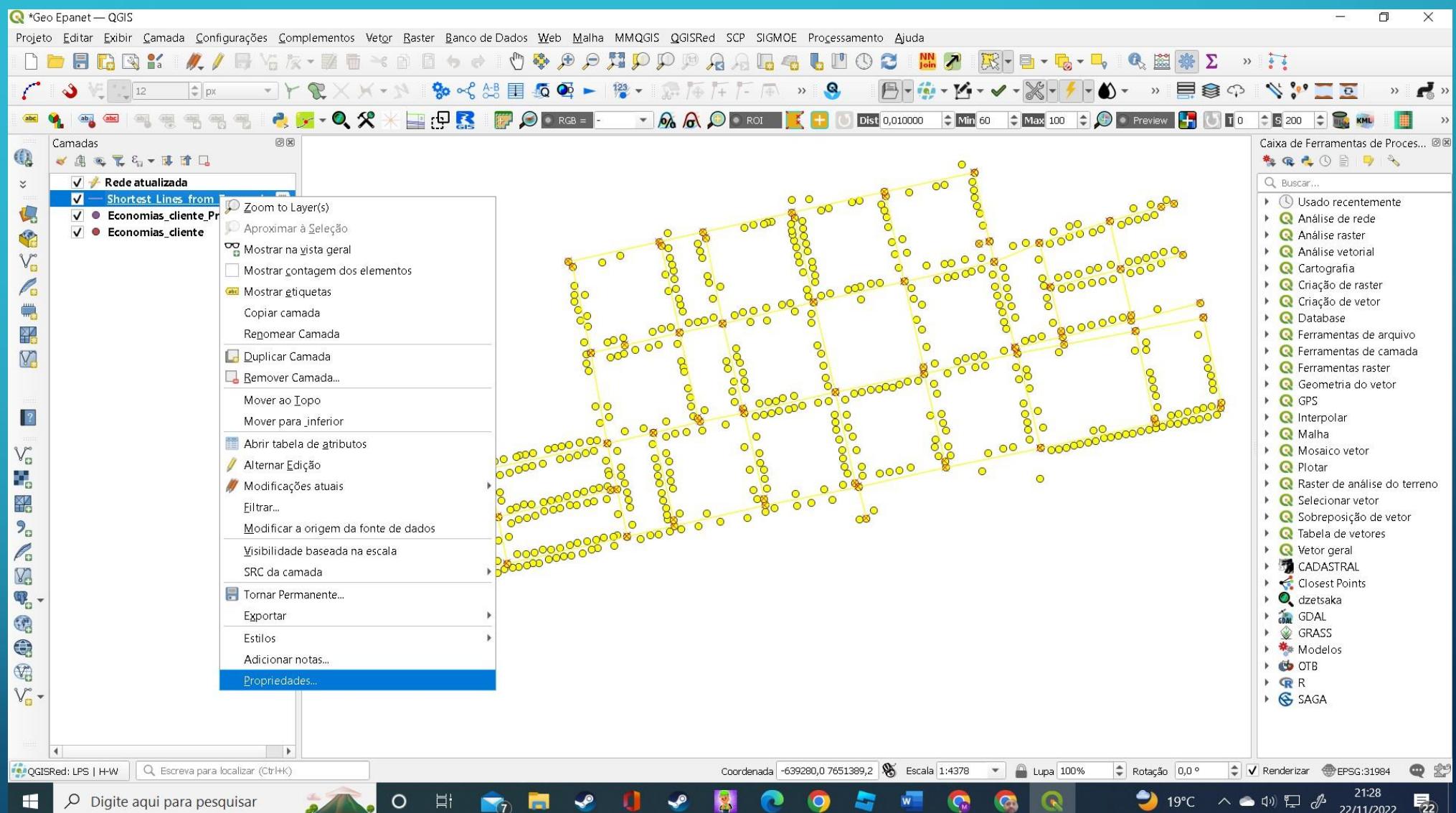


Figura 20 - Clicar com o botão direito na camada "Shortest Lines from..." e selecionar propriedades.

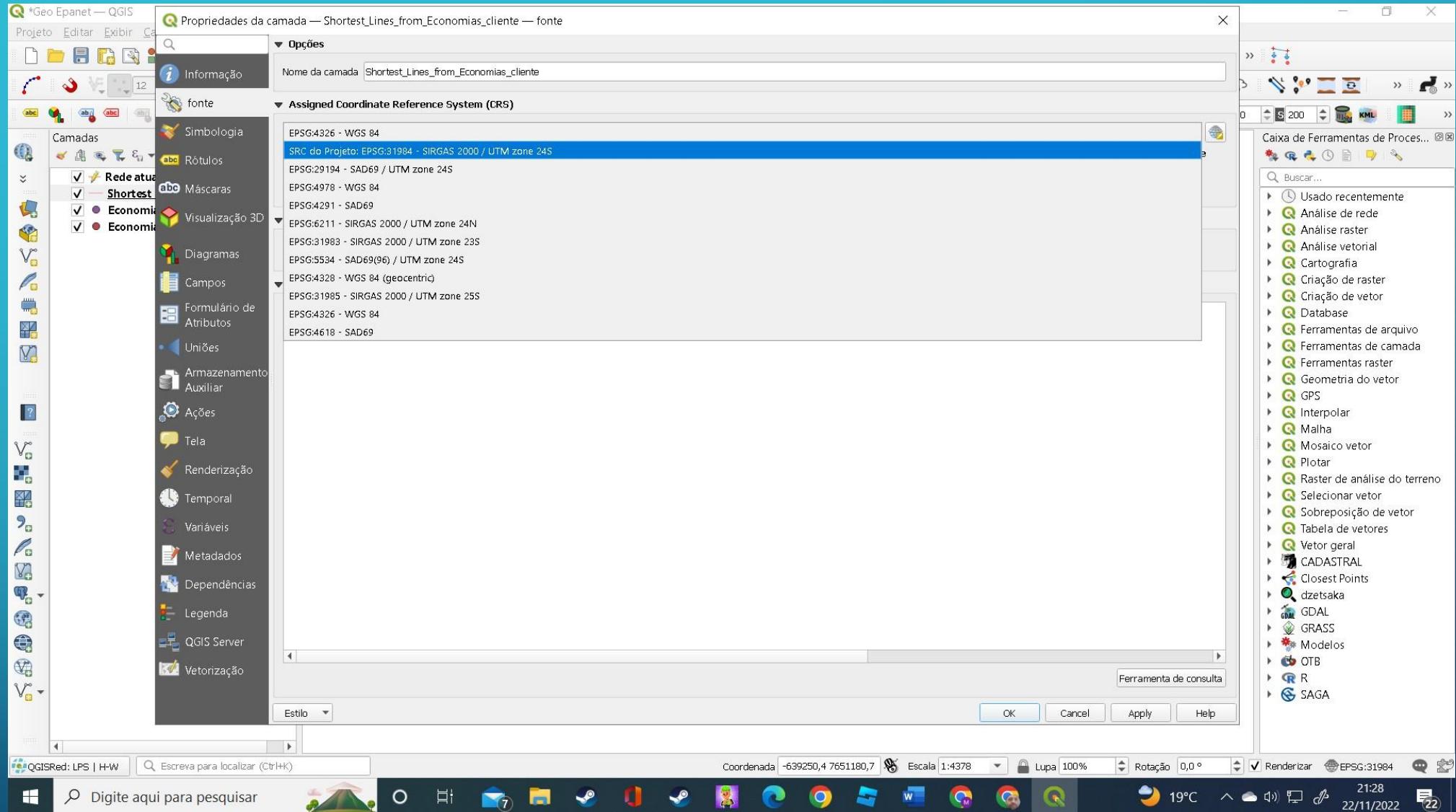


Figura 21 - Selecionar o “sistema de coordenada” do projeto

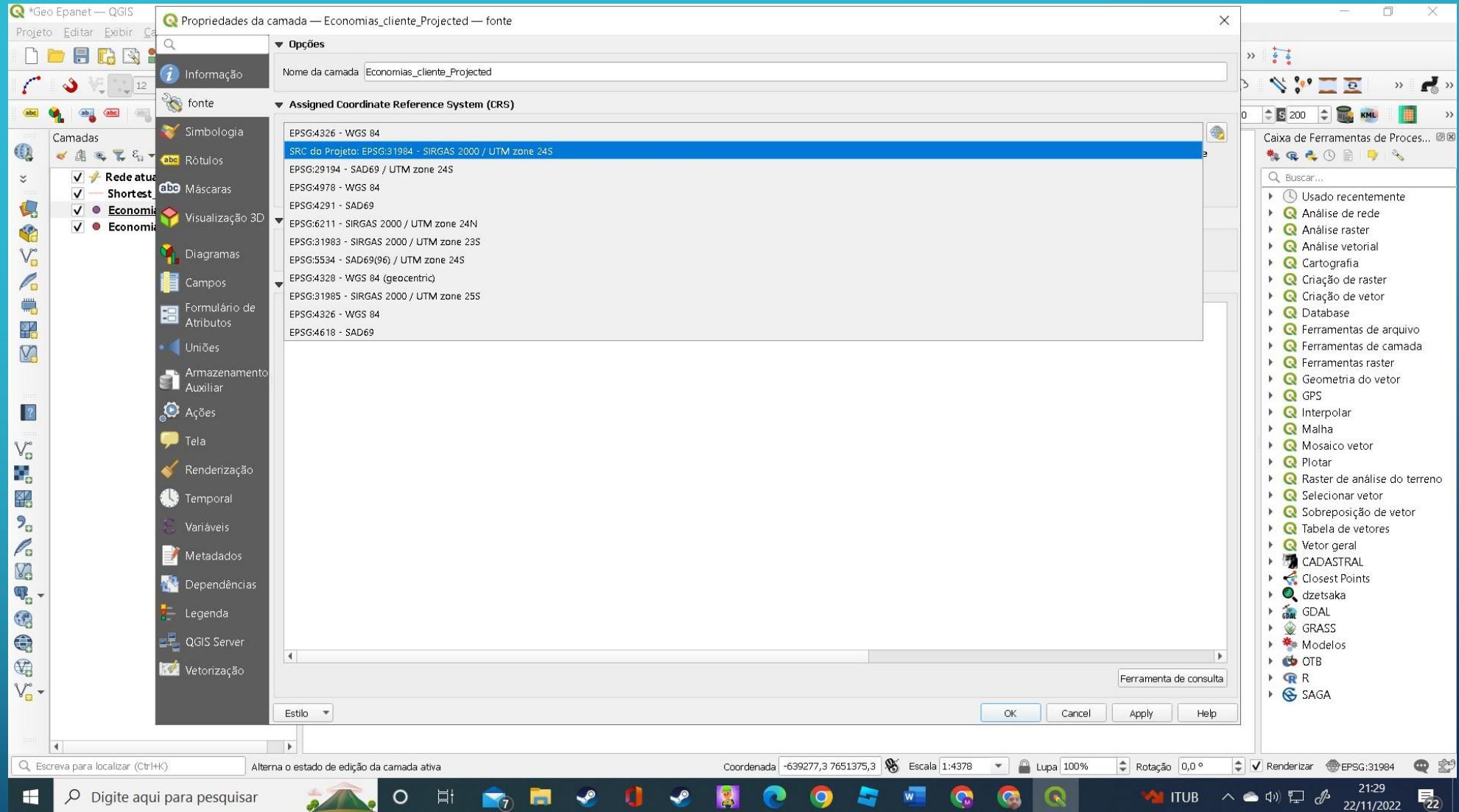


Figura 22 - Clicar com o botão direito na camada "Economias_cliente_Projected" e selecionar propriedades. -> Selecionar o sistema de coordenadas do projeto

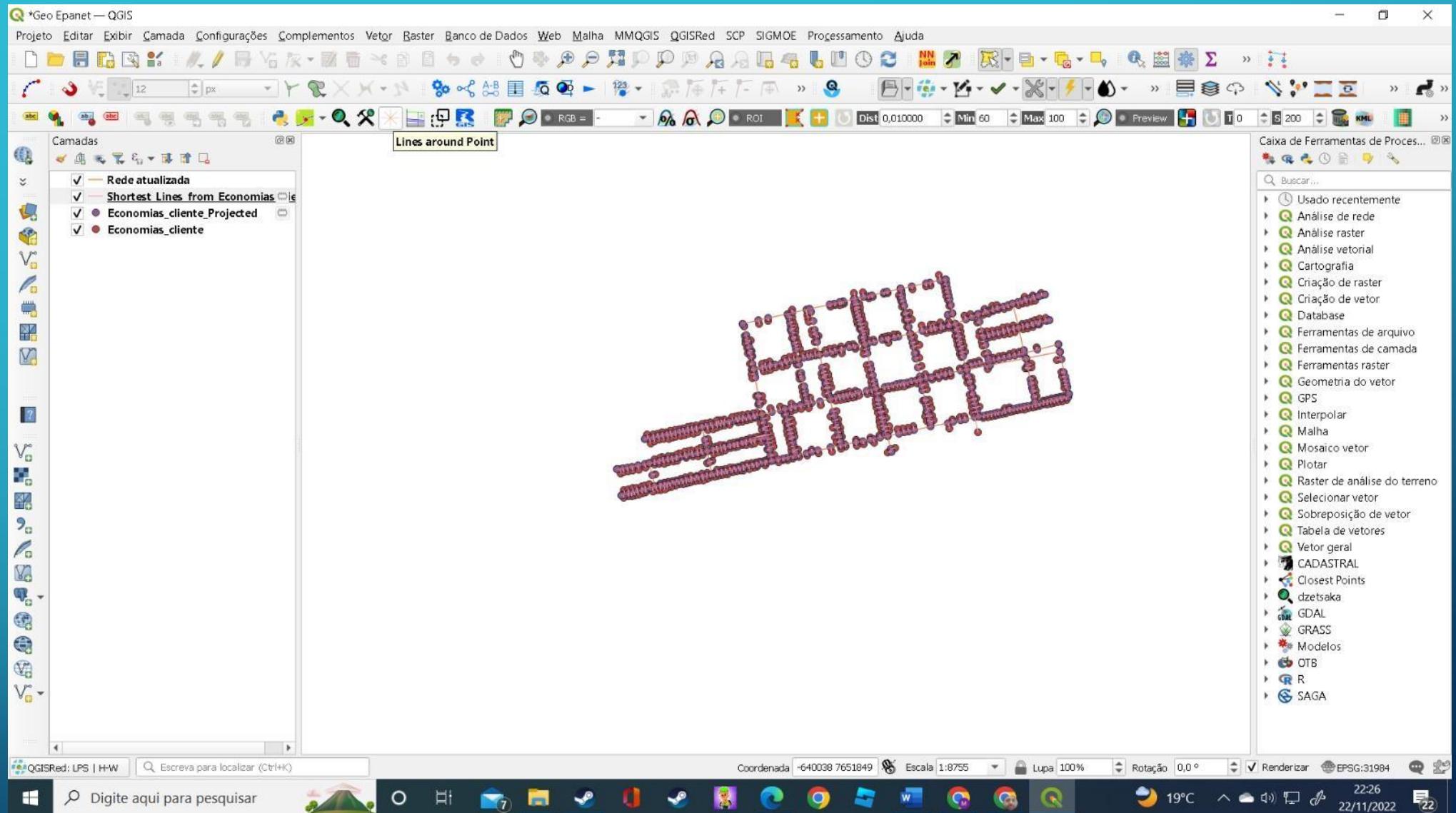


Figura 23 - Clicar no botão do complemento "Lines around Point"

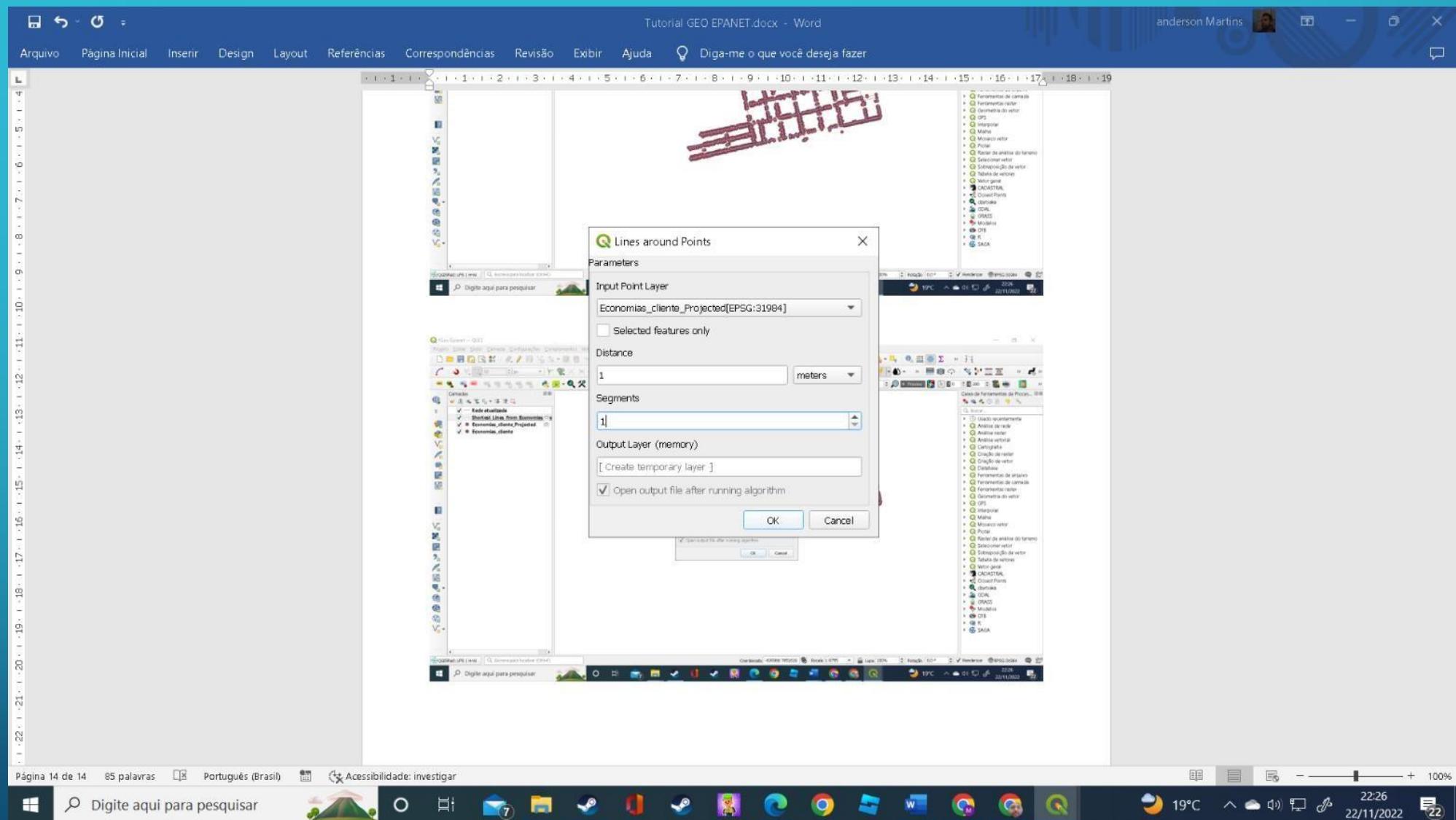


Figura 24 - Selecionar a camada "Economias_cliente_Projected" -> distance "1" -> Segments "1" -> Clicar em ok

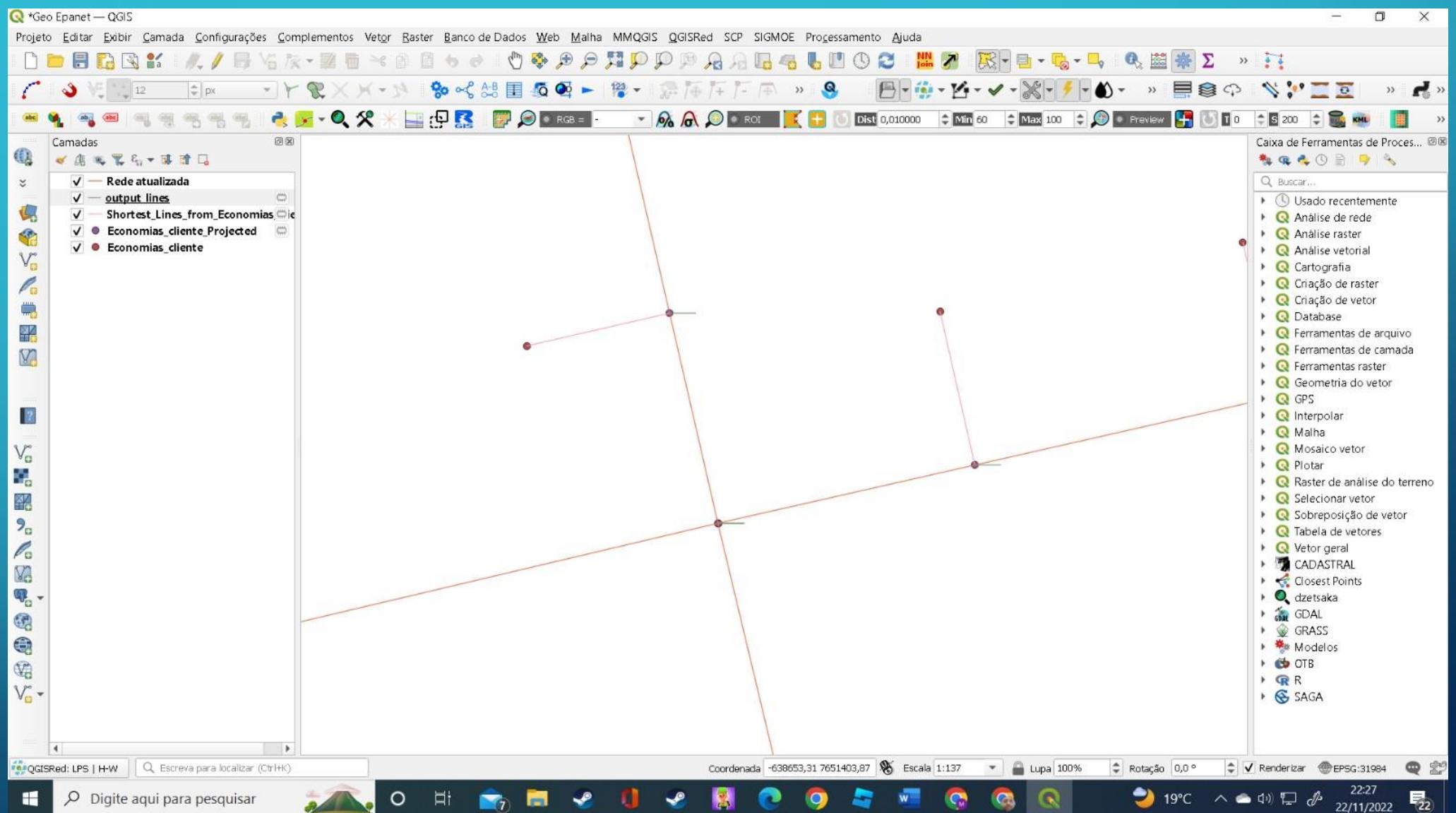


Figura 25 - Observe os pequenos traços de um metro ligados aos pontos e próximos as redes -> a camada “output lines” é o produto do complemento “Lines Around Points”.

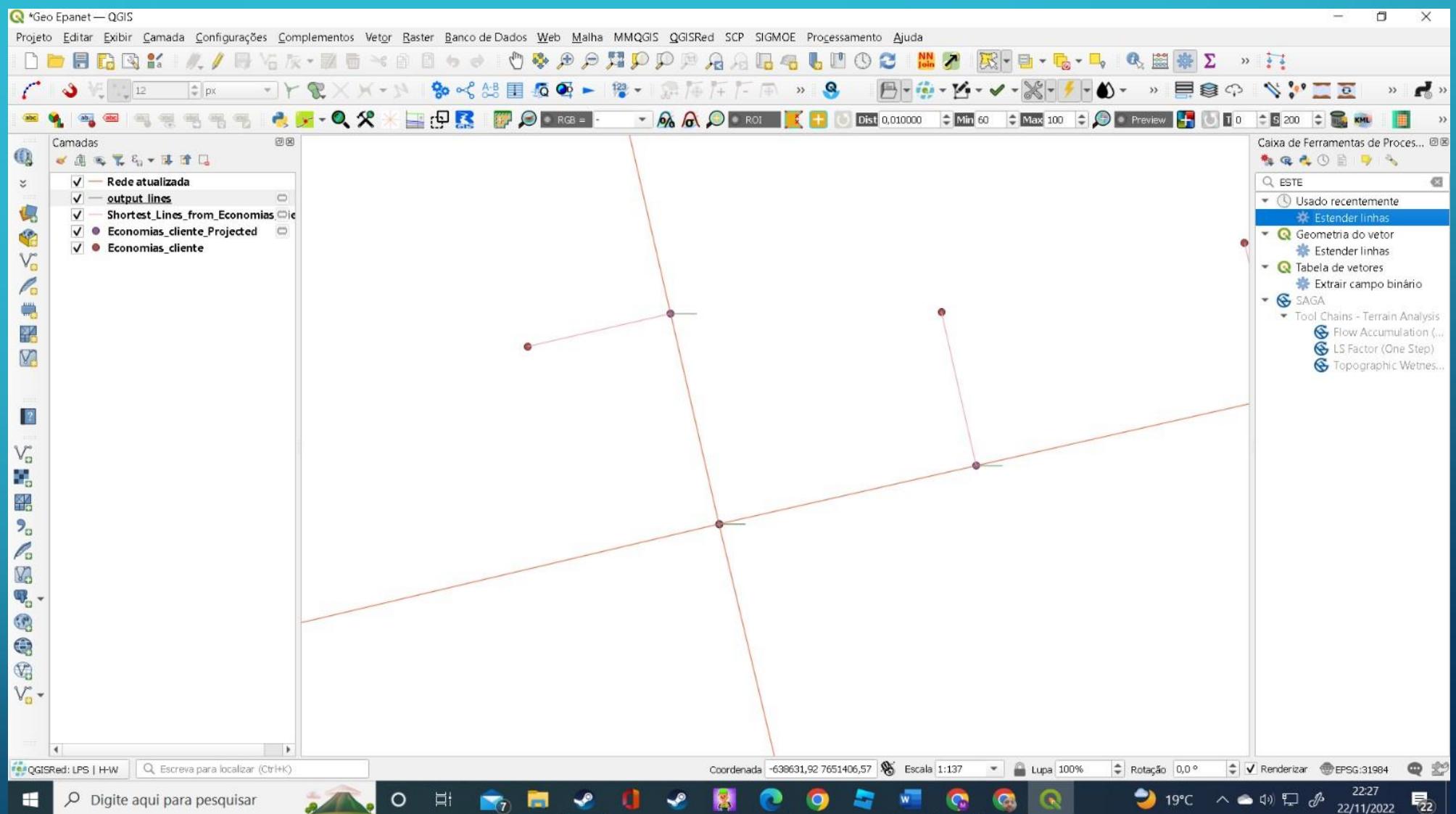


Figura 26 - Marcar a camada "output lines" e selecionar a ferramenta "Estender linhas"

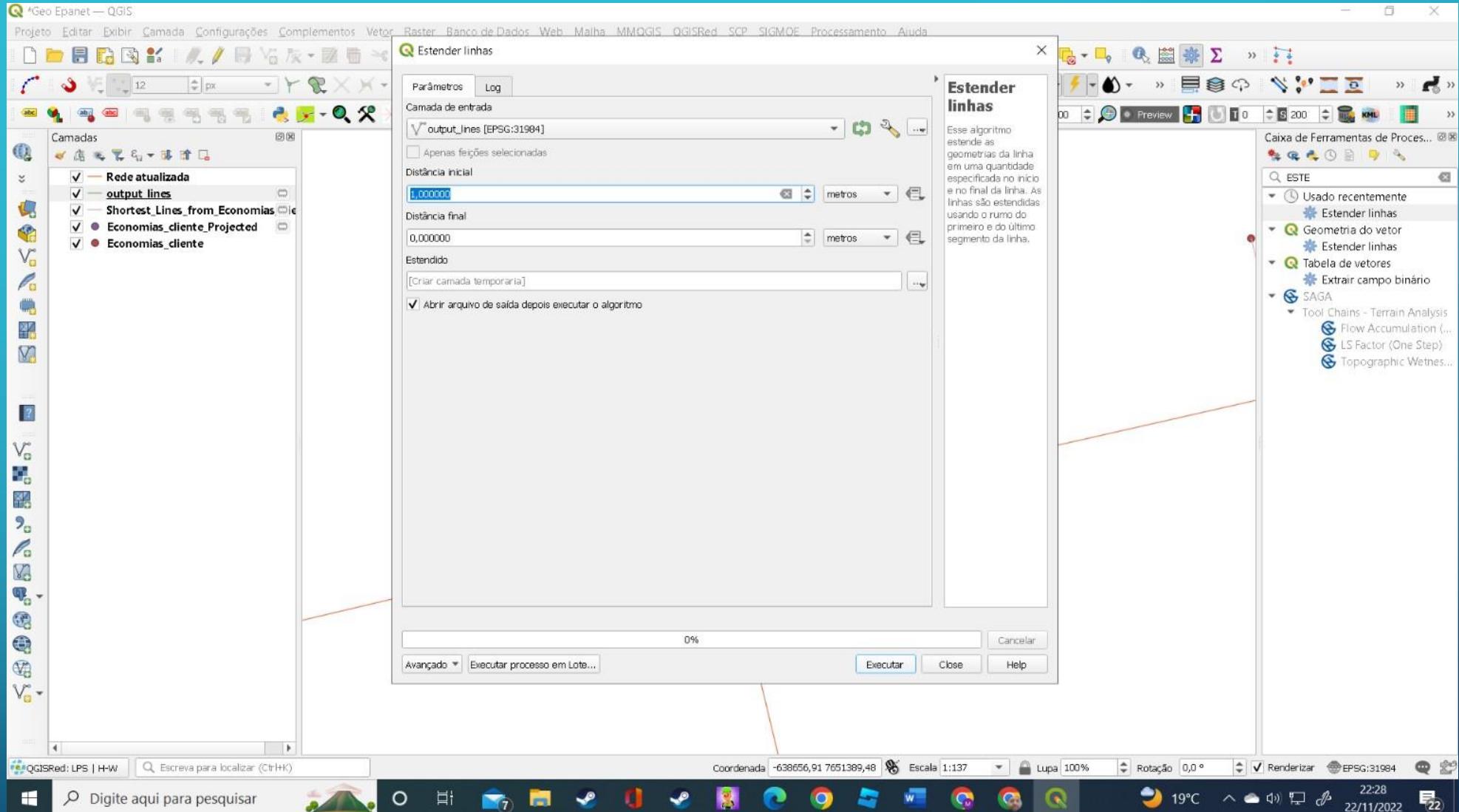


Figura 27 - digitar "1,000000" no campo "distancia inicial" e clicar em "Executar"

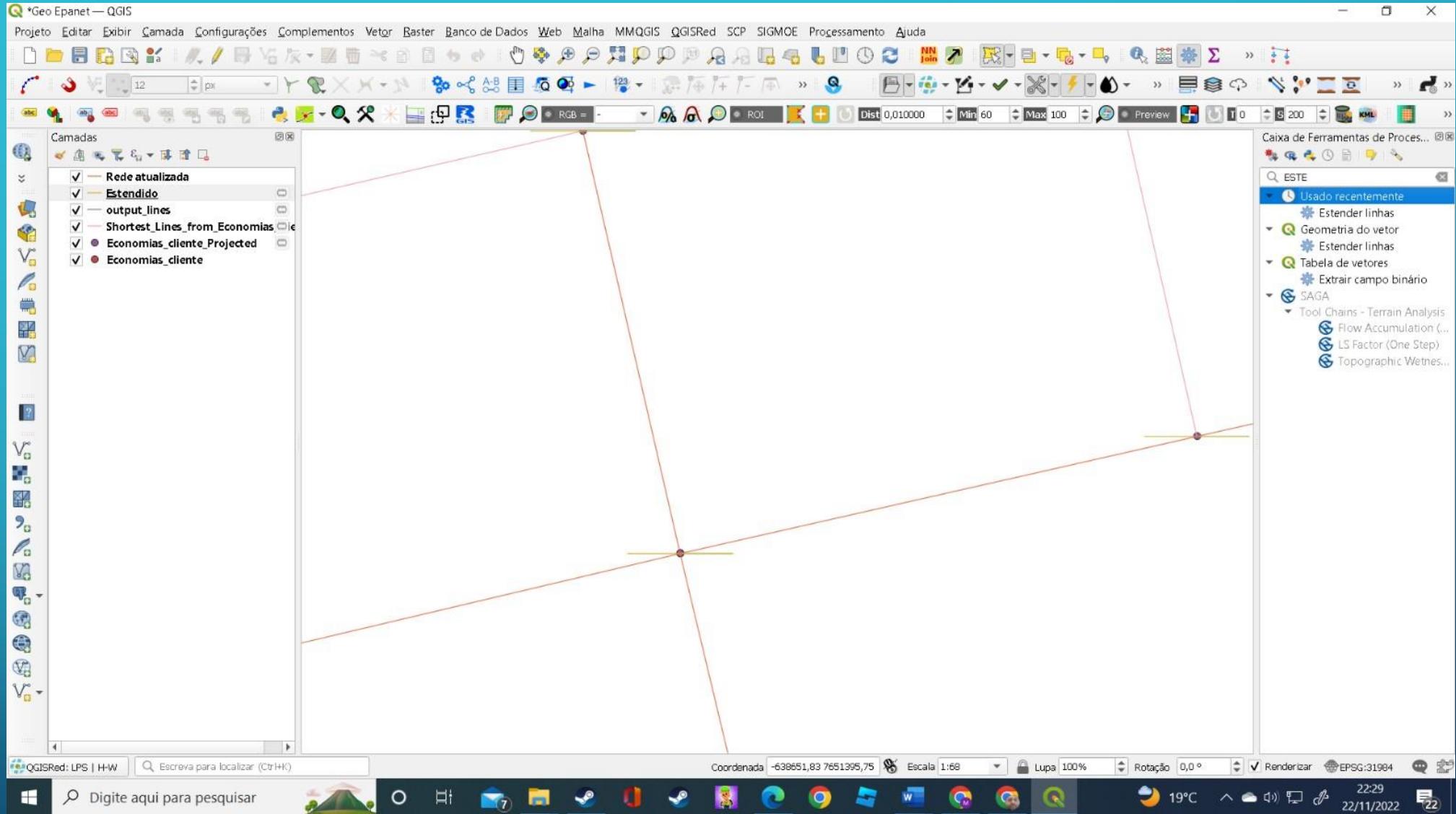


Figura 28 - O produto foi a camada "estendido" -> observe como agora as linhas cruzam as linhas da camada "rede atualizada"

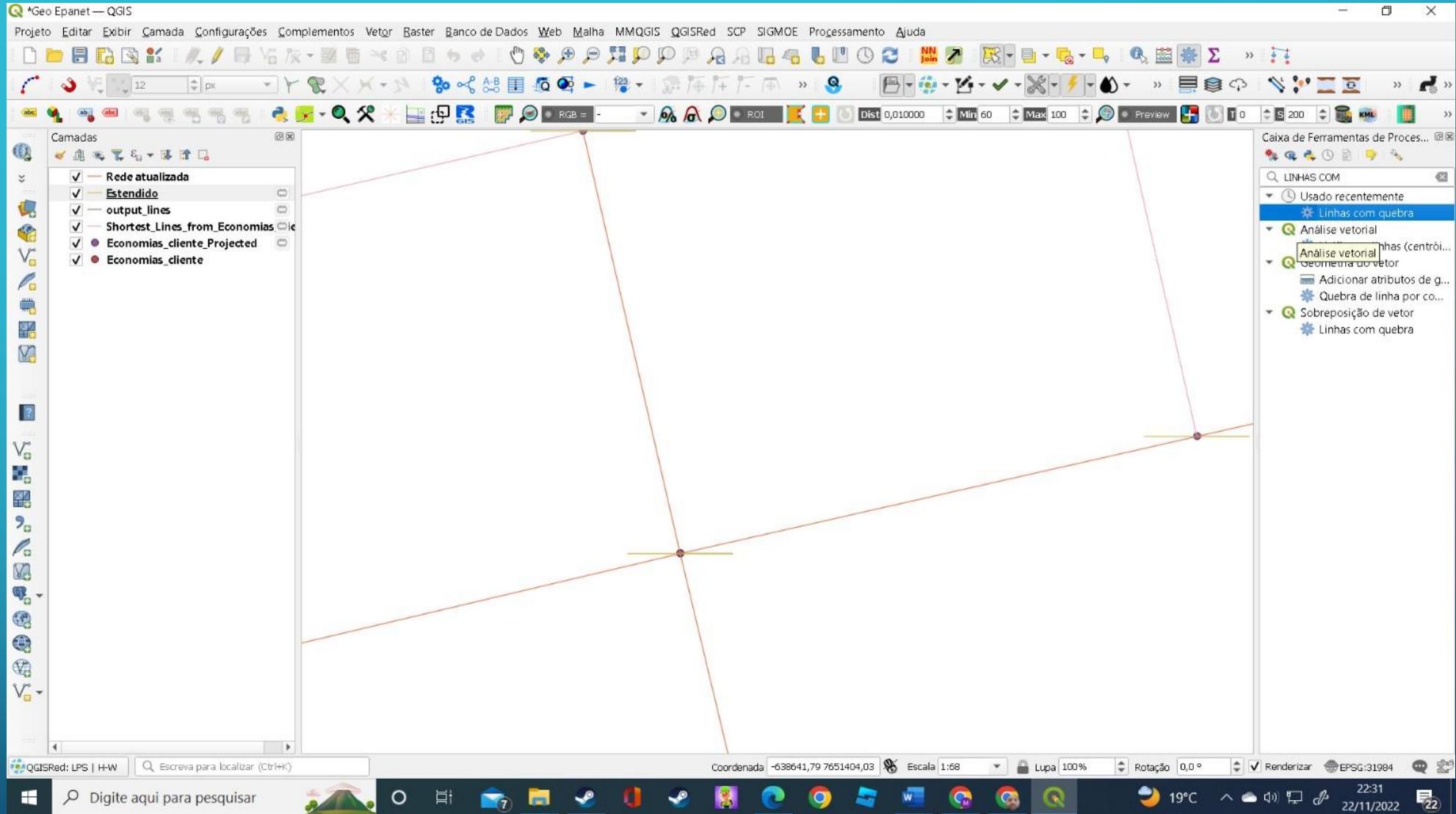


Figura 29 - Agora vamos utilizar a ferramenta "Linhas com quebra" para segmentar as linhas da camada rede com na intersecção com as linhas da camada "estendido"

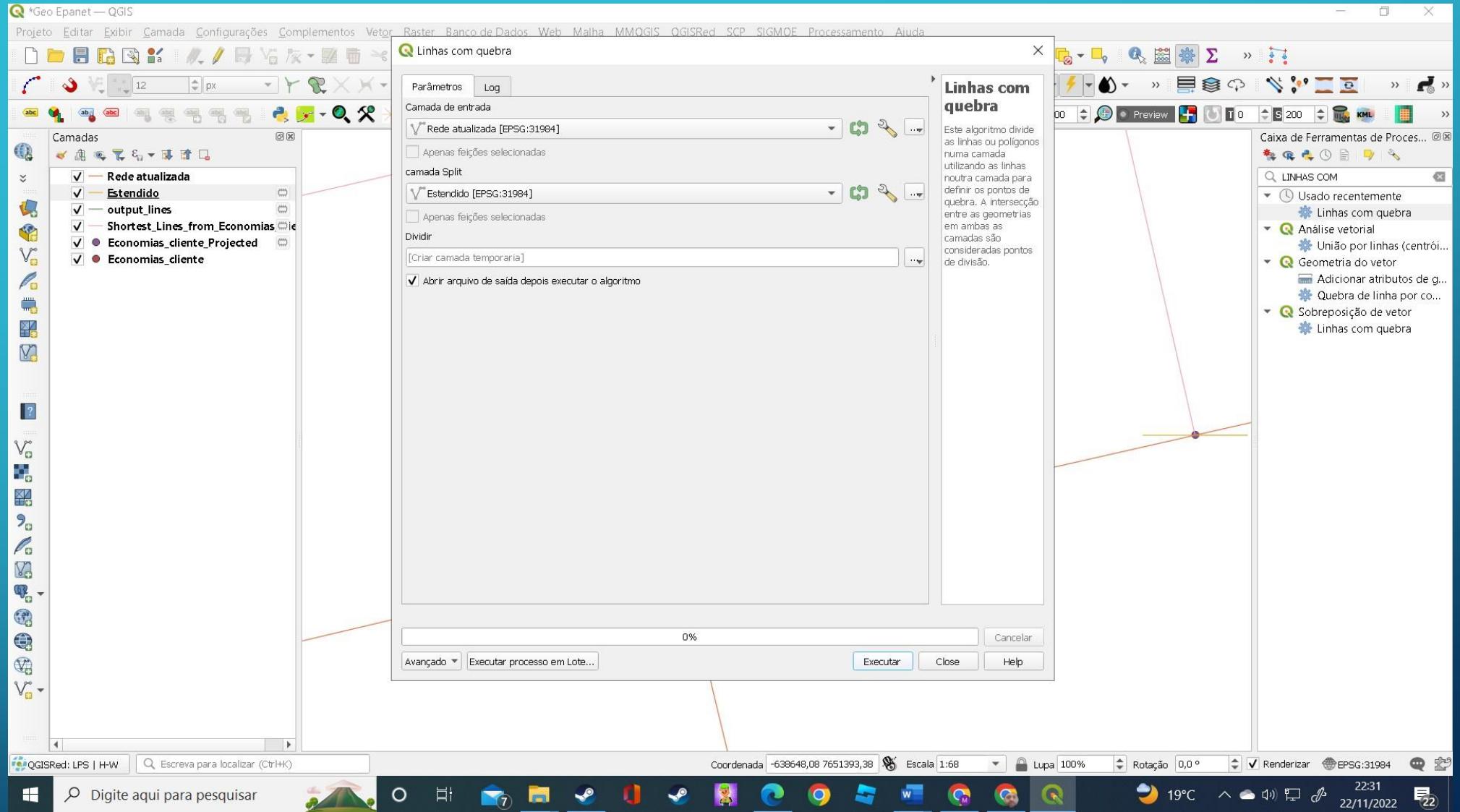


Figura 30 - Selecionar na camada de entrada "Rede atualizada" e na camada split "Estendido"

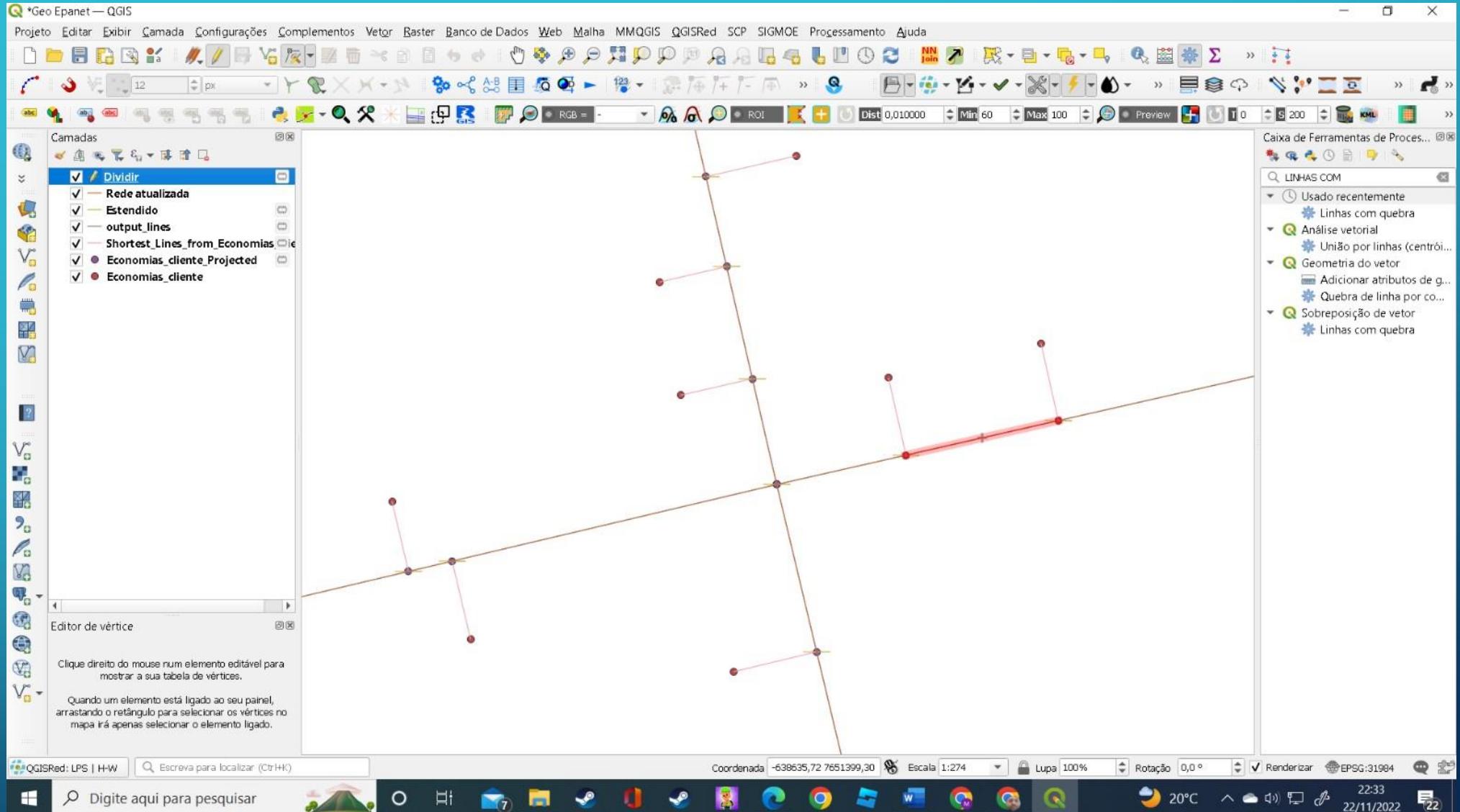


Figura 31- Observe que o produto foi a camada dividir e a rede foi segmentada.

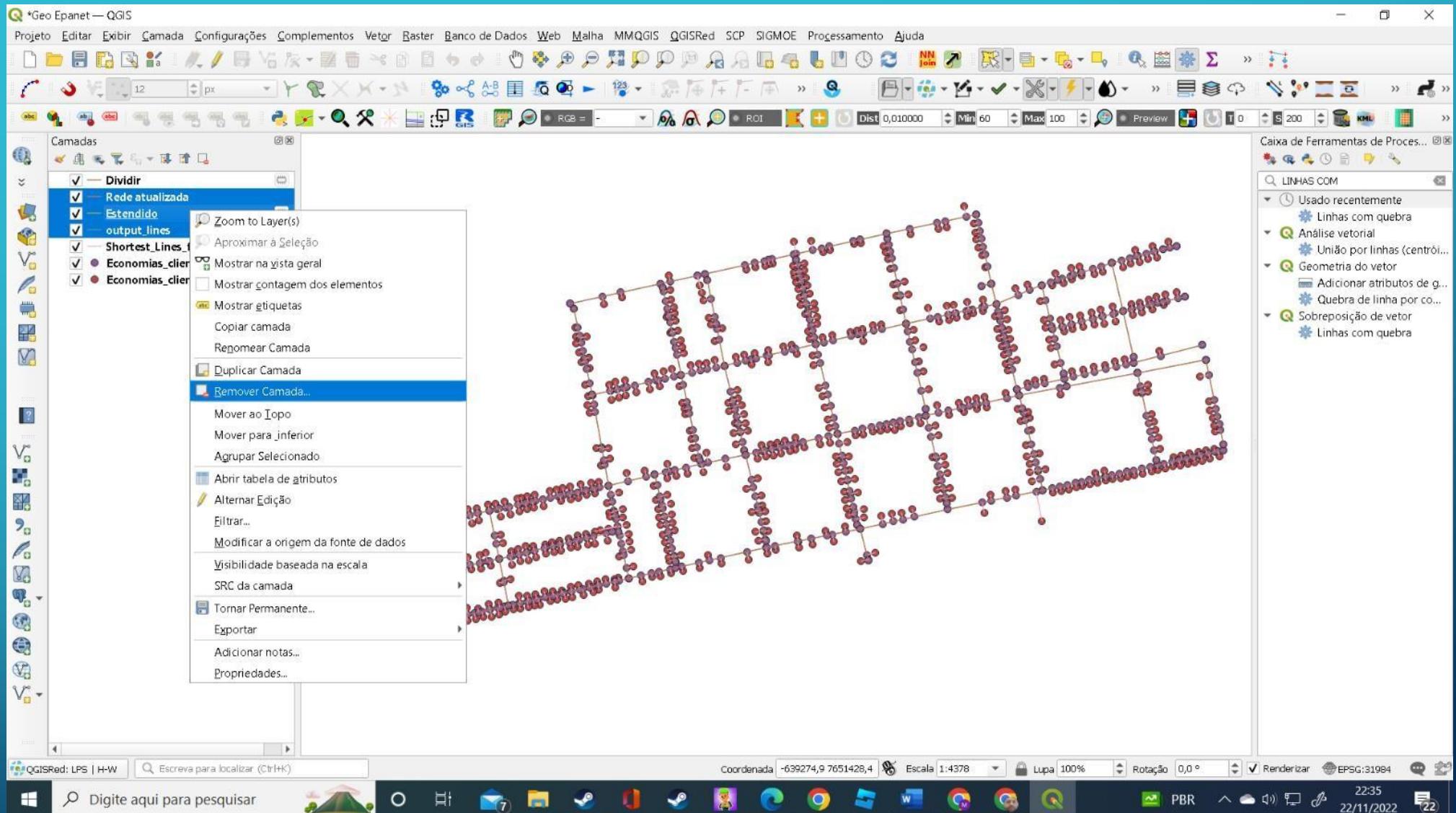


Figura 32- Remover as camadas que não são mais úteis

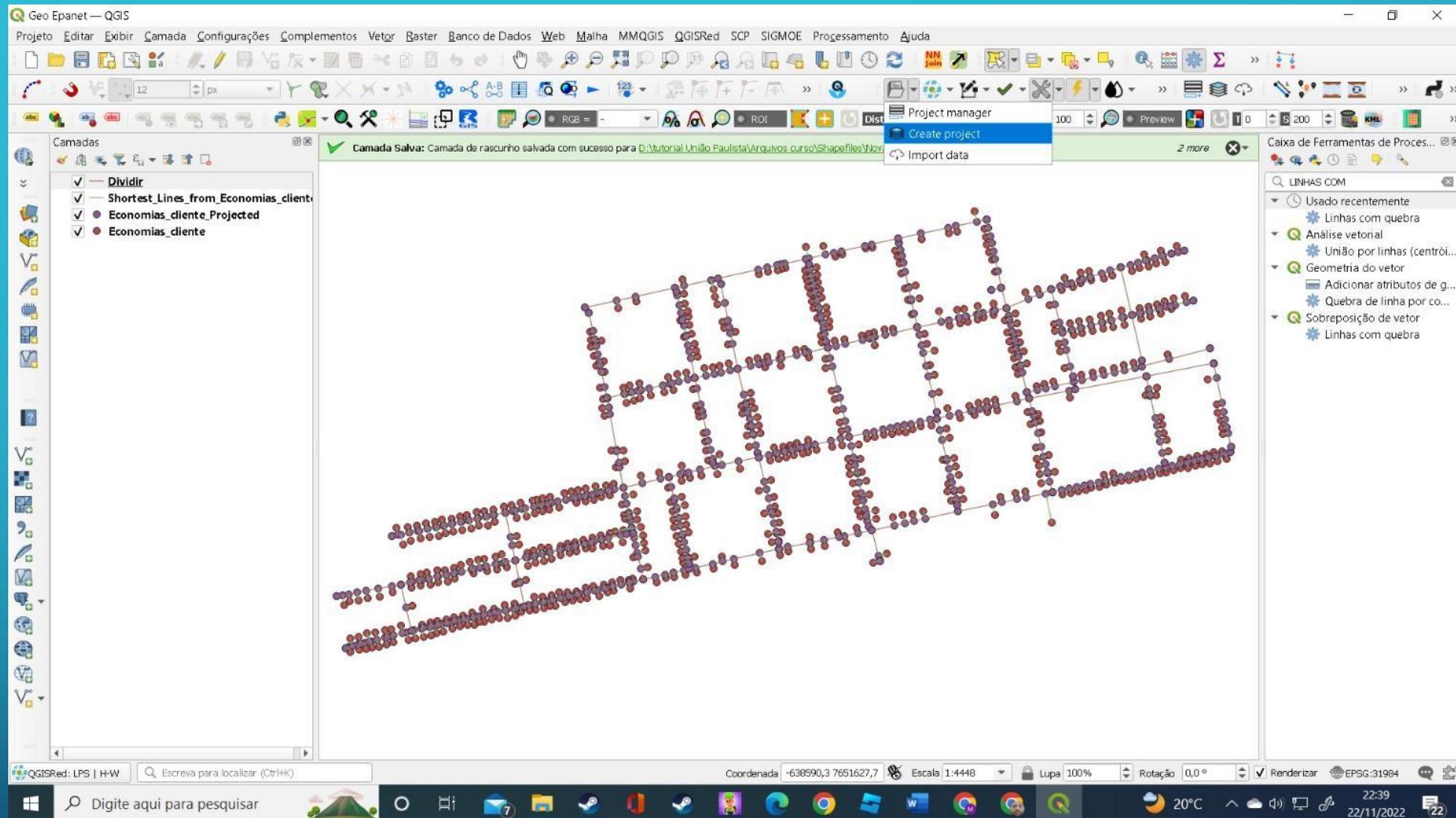


Figura 33- Criar um novo projeto do EPANET no "QgisRed"

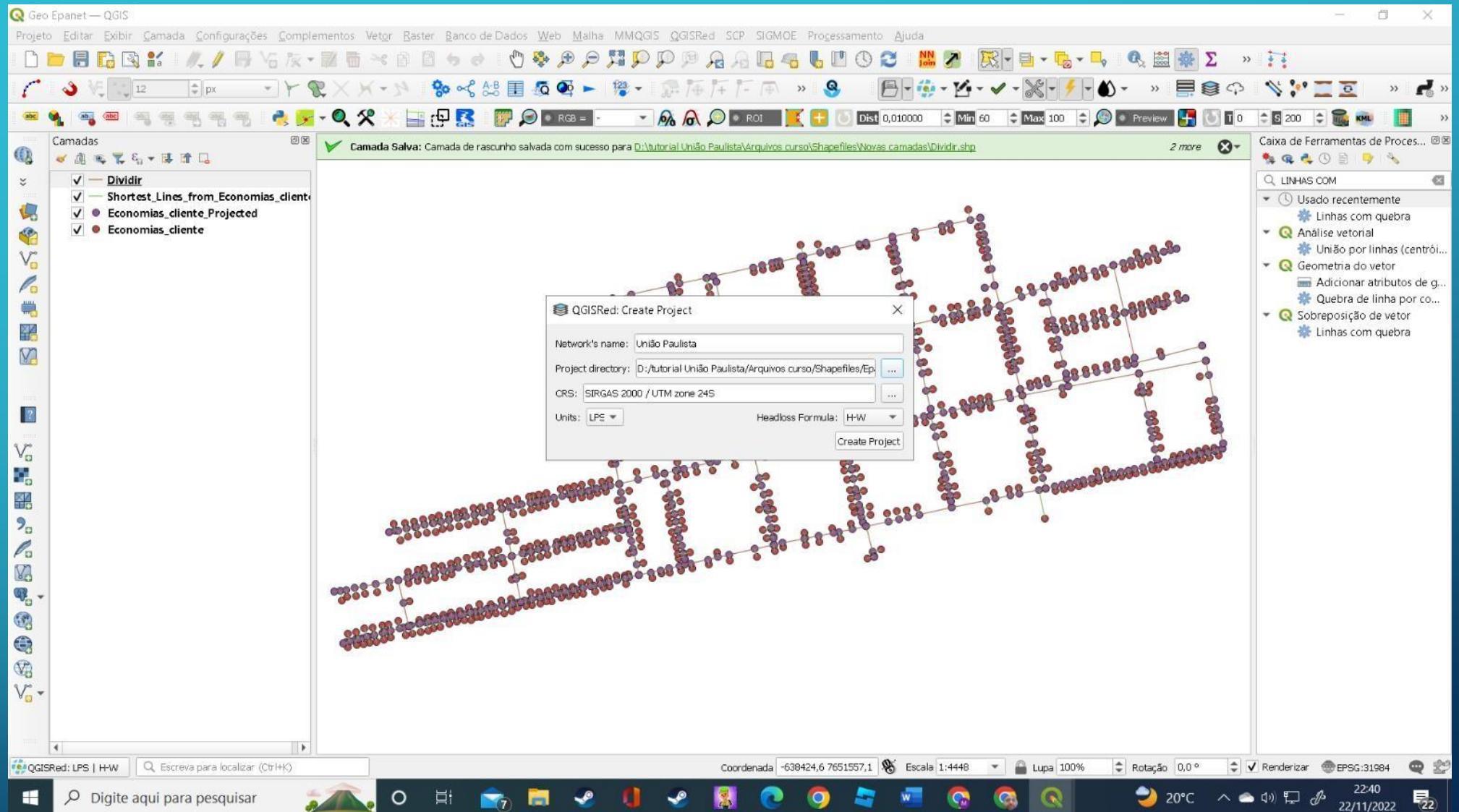


Figura 34 - Um exemplo de como selecionar os parâmetros

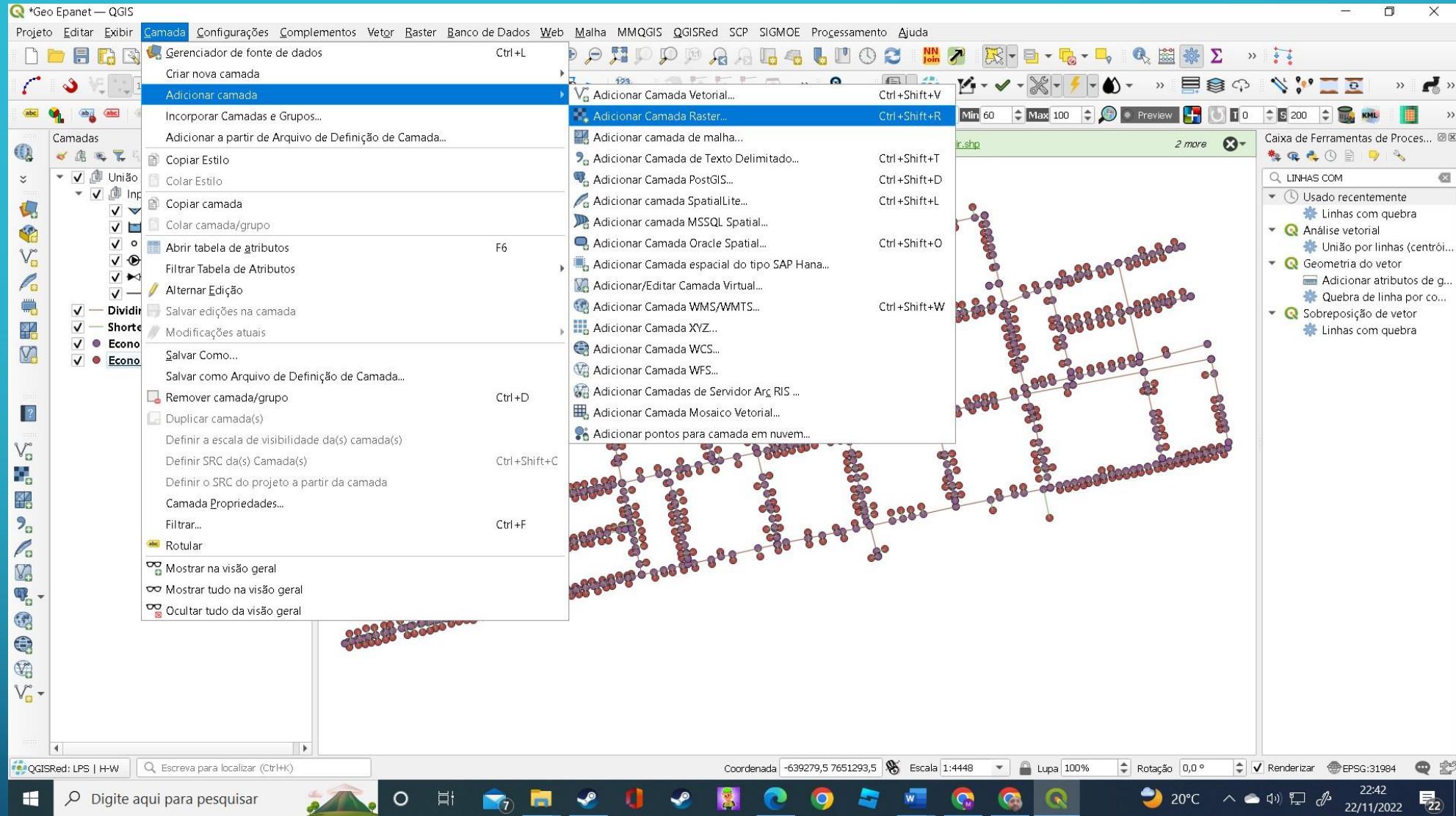


Figura 35 - Adicionar o Raster "MDE - modelo digital de elevação" onde vamos obter as "cotas" utilizadas no projeto

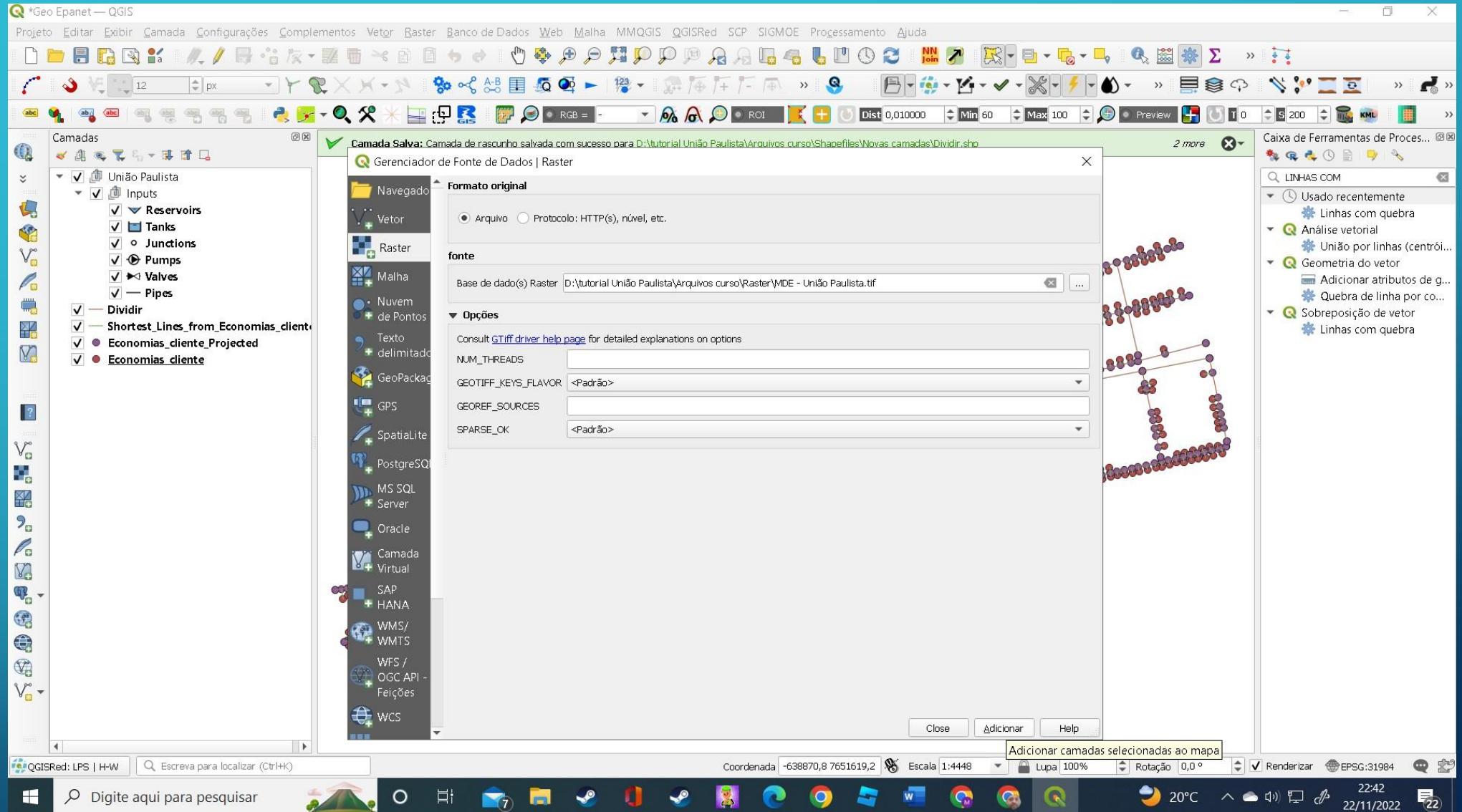


Figura 36 - Selecionar o arquivo "MDE - União Paulista.tif" na pasta raster

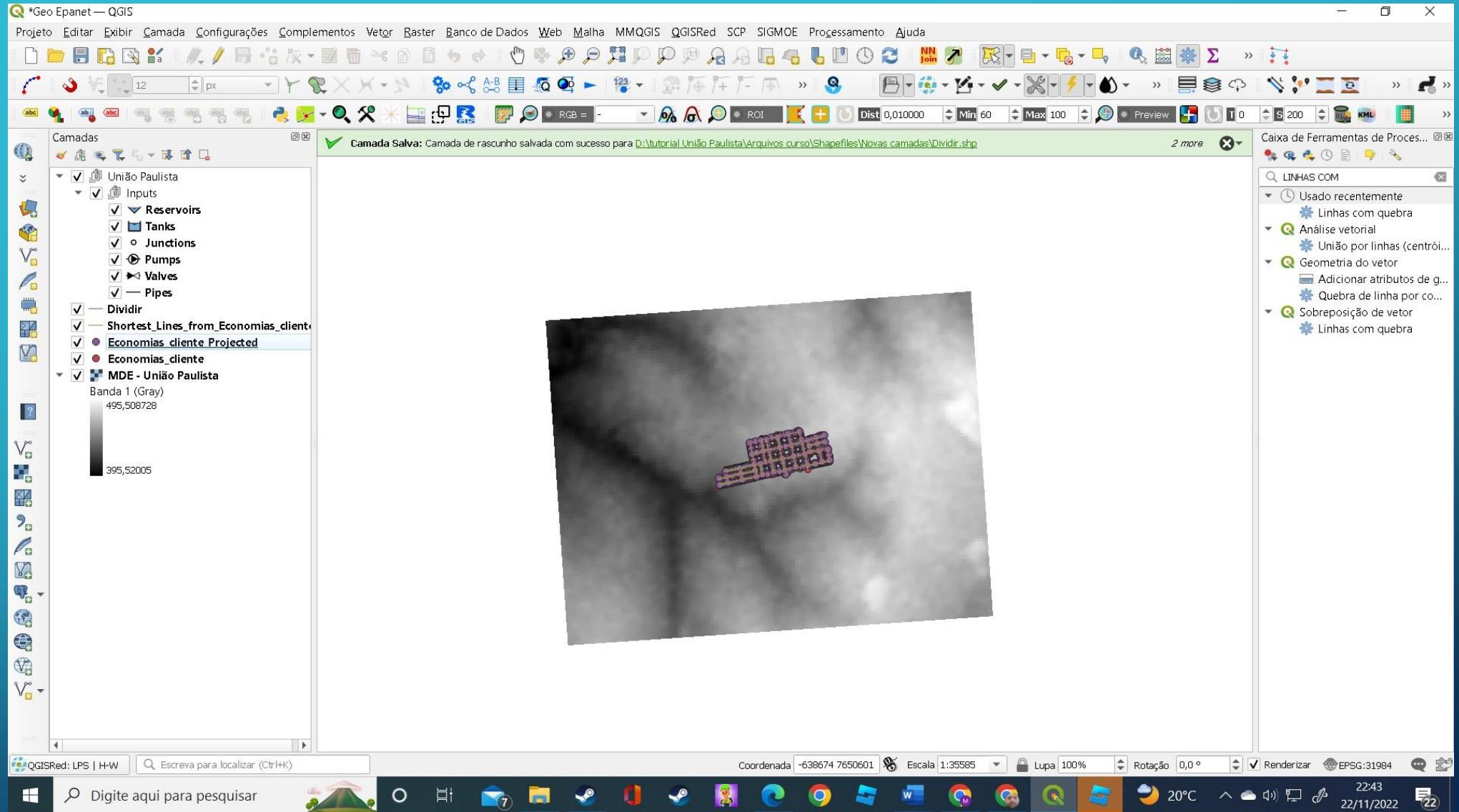


Figura 37- Camada Raster ao fundo

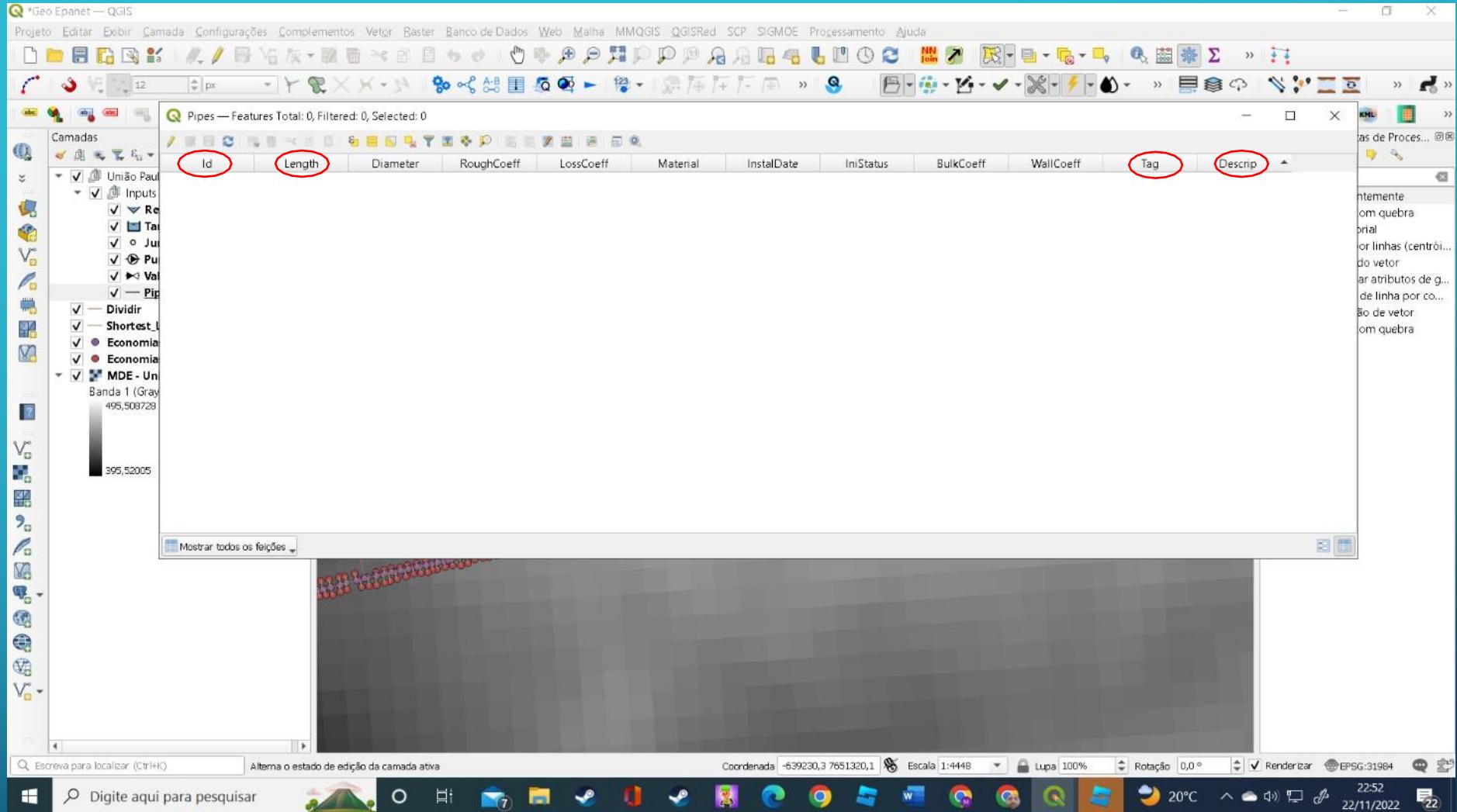


Figura 38- O Próximo passo é criar os campos destacados da camada "Pipes" nas camadas "Shortest_Lines_from_Economias_cliente" e "dividir"

*Geo Epanet — QGIS

Projeto Editar Exibir Camadas

Informação fonte Símbologia Rótulos Máscaras

União Paus Inputs Rotação Tabelas Juntas Páginas Visualização 3D Diagramas

Camadas

Dividir Shortest Economia Economia MDE - Unidades

Banda 1 (Grade) 495,508728 Ações

Propriedades da camada — Pipes — Campos

ID	Nome	Apelido	Tipo	Tipo do nome	Comprimento	Precisão	Comentário
abc 0	Id		QString	String	31	0	
1.2 1	Length		double	Real	9	3	
1.2 2	Diameter		double	Real	9	3	
1.2 3	RoughCoeff		double	Real	9	4	
1.2 4	LossCoeff		double	Real	9	3	
abc 5	Material		QString	String	64	0	
abc 6	InstalDate		QString	String	64	0	
abc 7	IniStatus		QString	String	128	0	
1.2 8	BulkCoeff		double	Real	9	3	
1.2 9	WallCoeff		double	Real	9	3	
abc 10	Tag		QString	String	128	0	
abc 11	Descrip		QString	String	128	0	

Figura 39 - Observar para cada campo "nome"; "Tipo". "Comprimento" e "precisão"

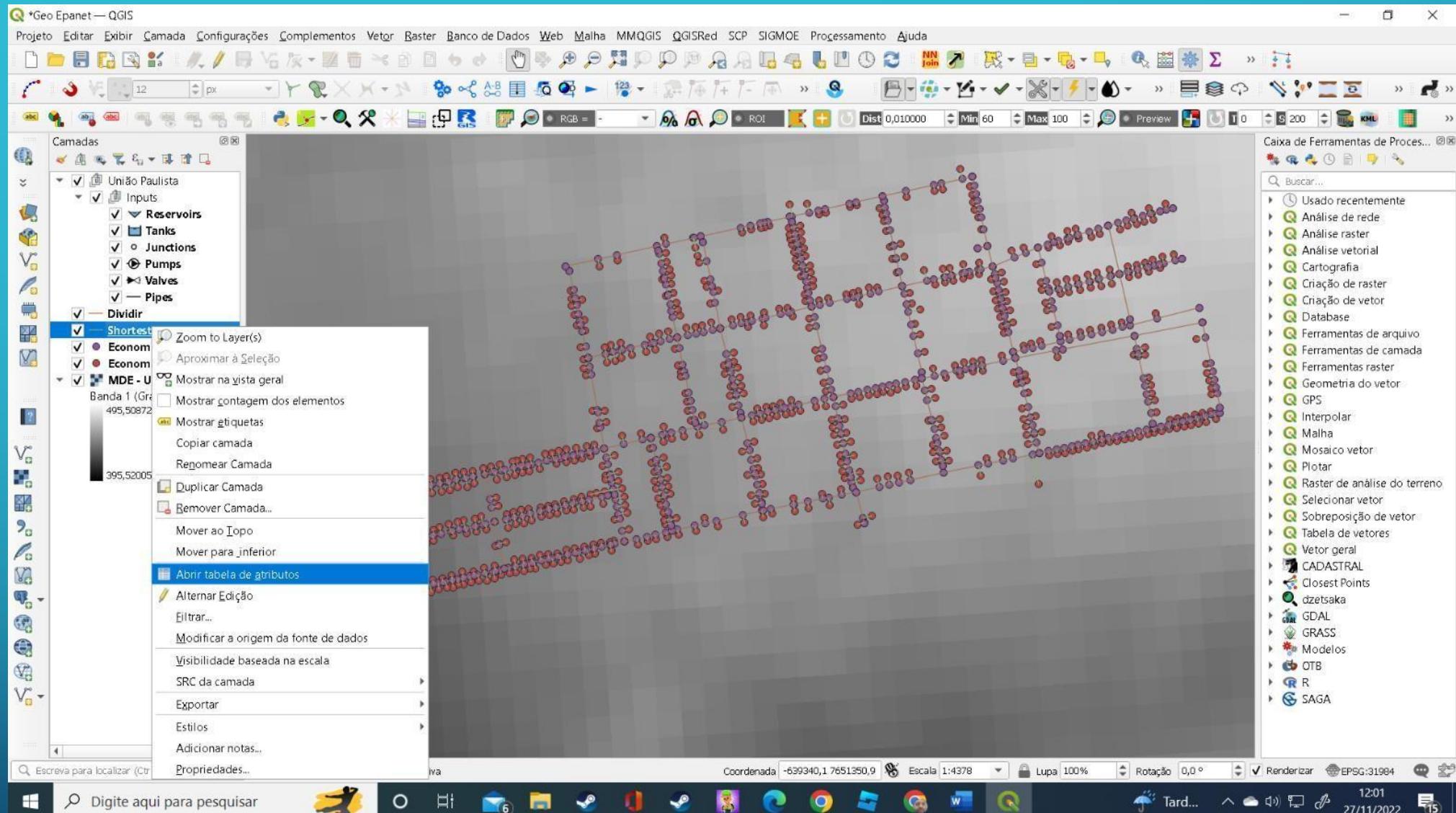


Figura 40 - Abrir a "tabela de atributos" da camada "Shortest_Lines_from_Economias_cliente"

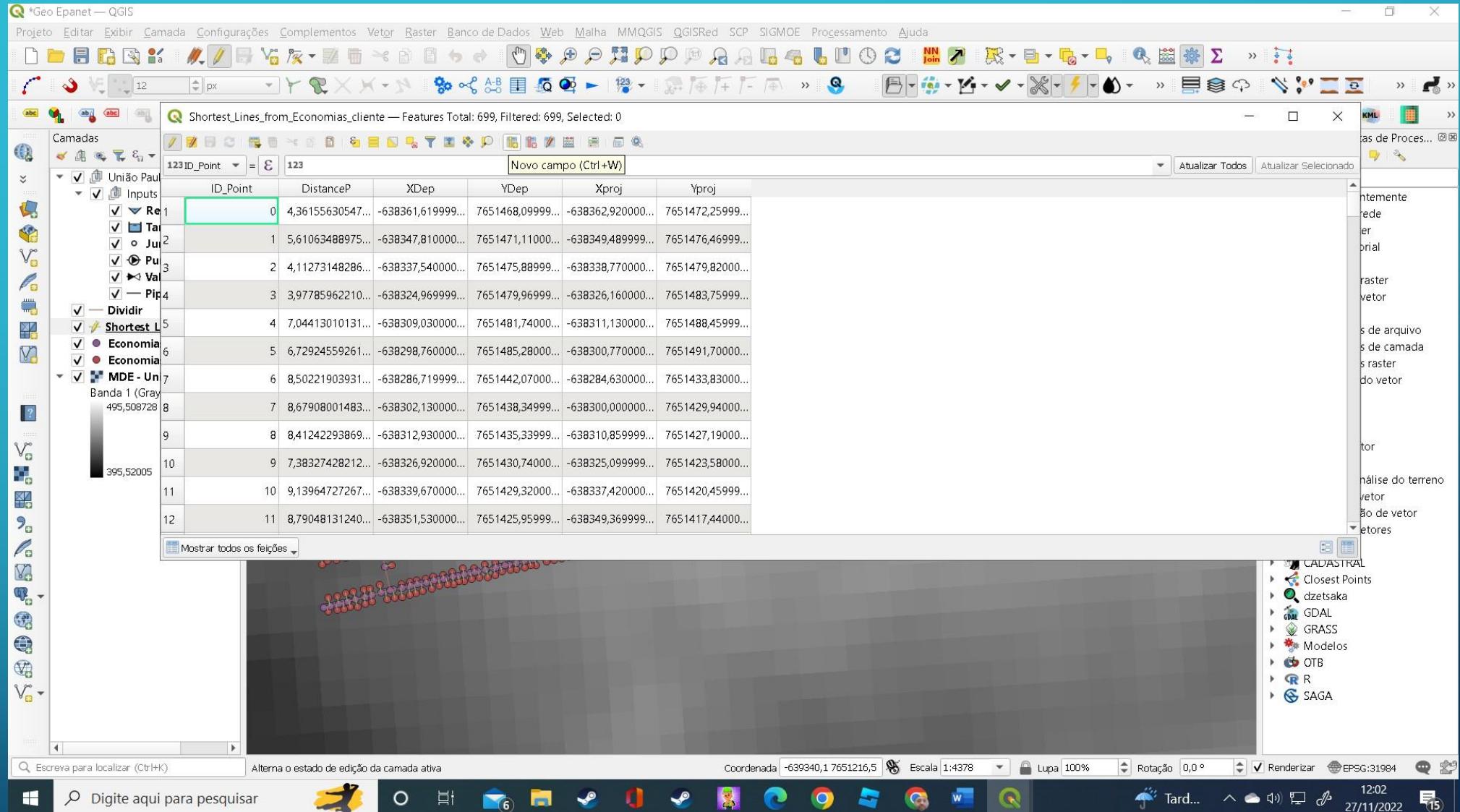


Figura 41- Clicar no botão "Novo Campo"

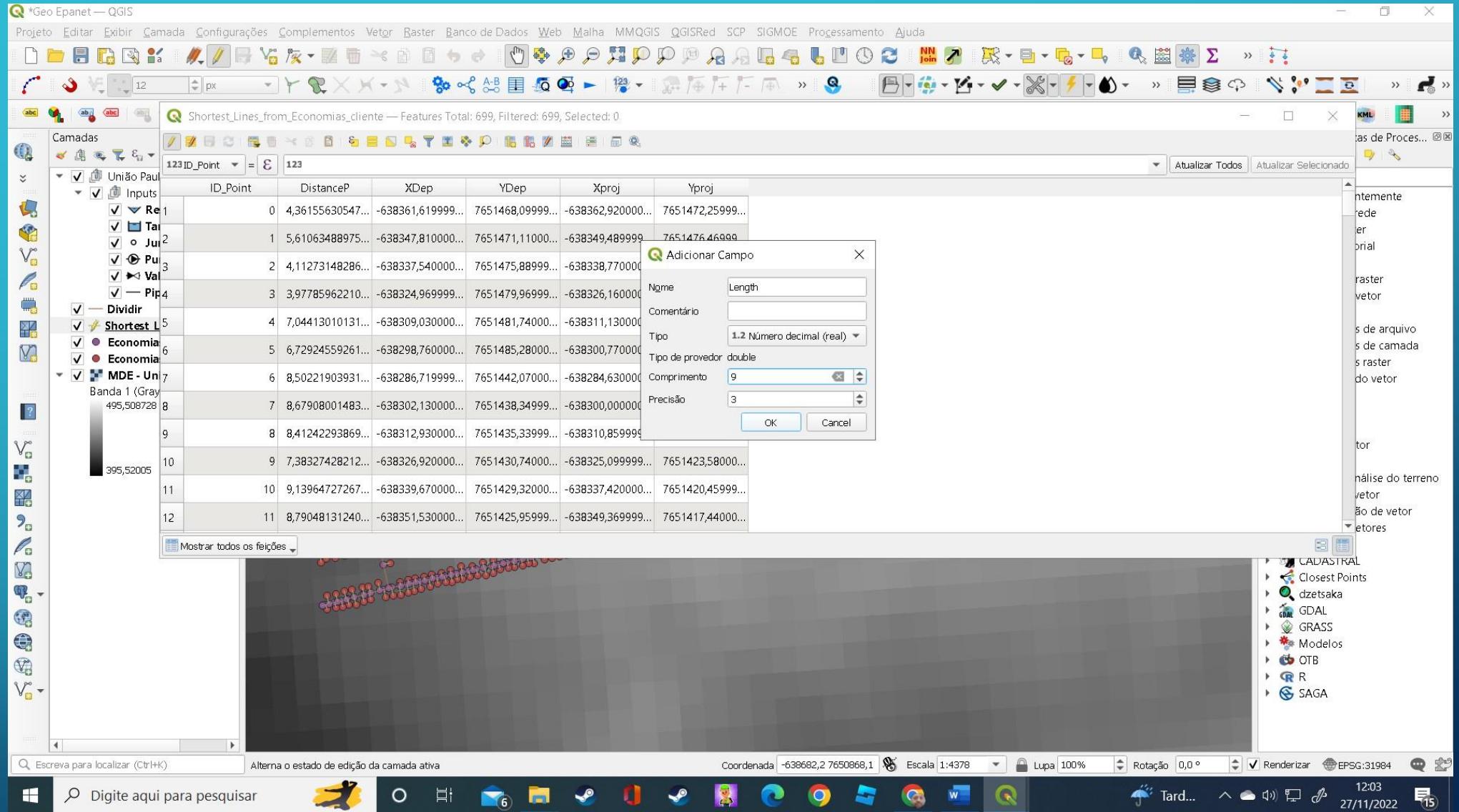


Figura 42 - Preencher os campos de acordo com a tabela de campos da camada "Pipes" visualizada acima

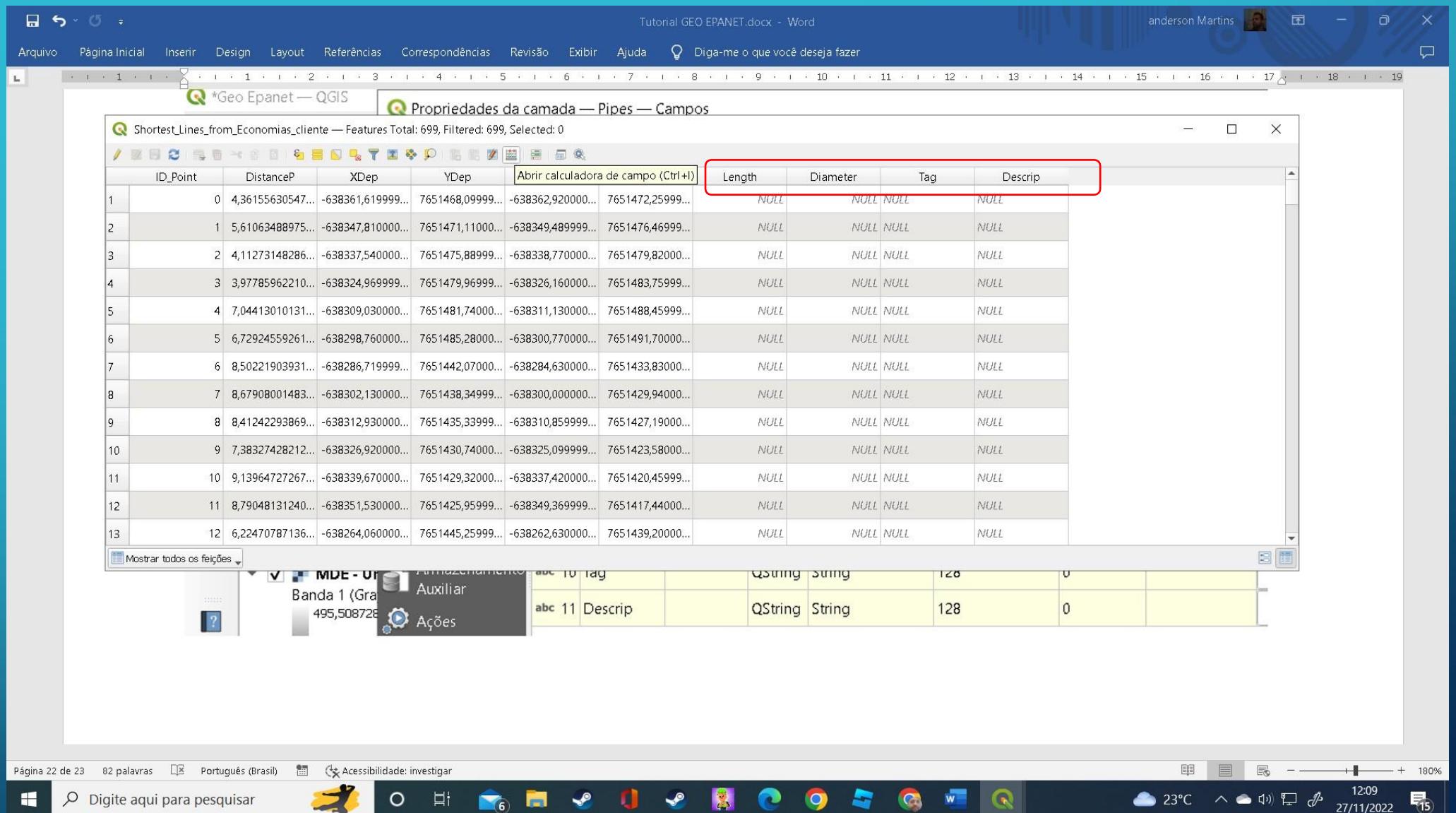


Figura 43- Criar os quatro campos conforme indicado

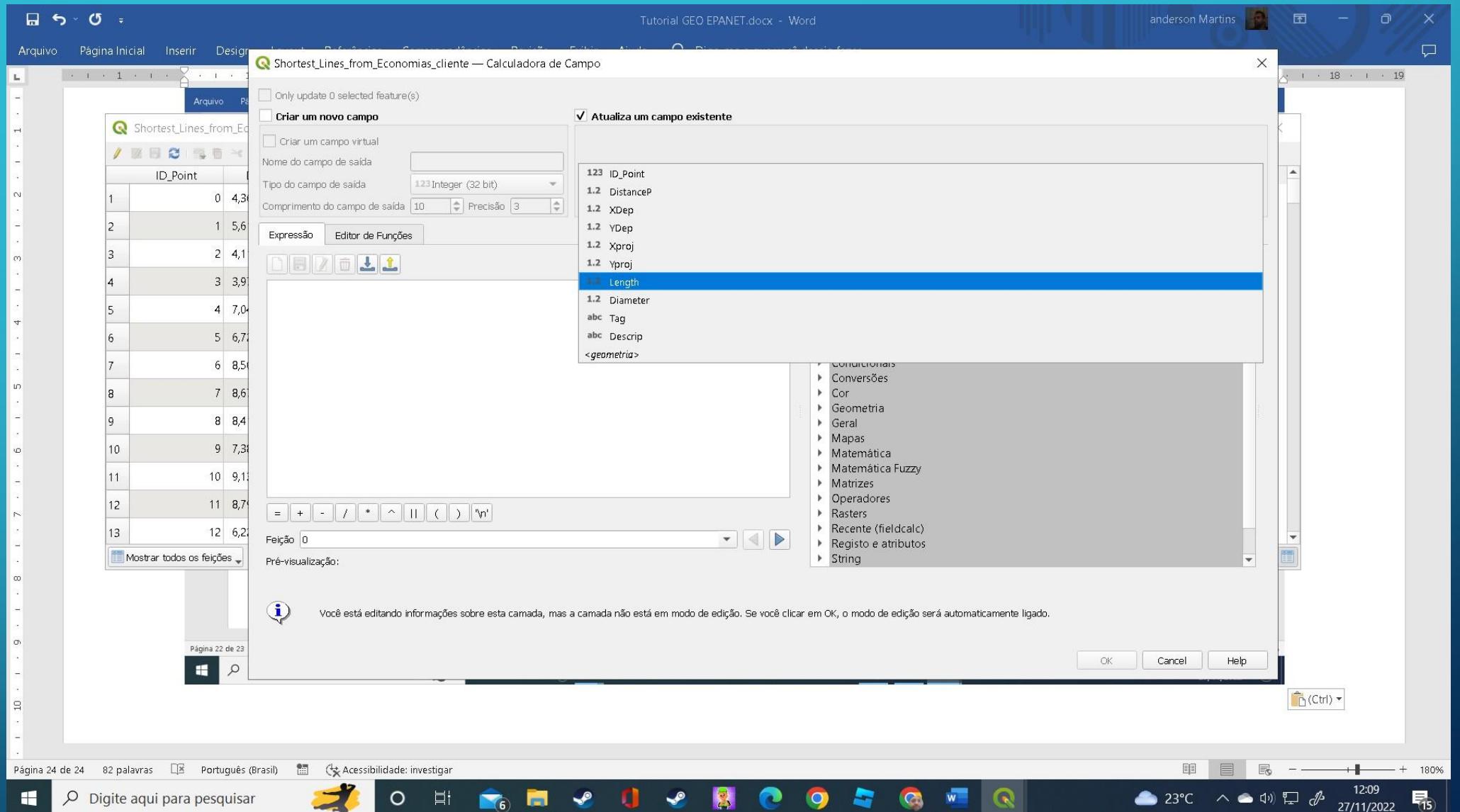


Figura 44 - Atualizar os valores do campo "Length"

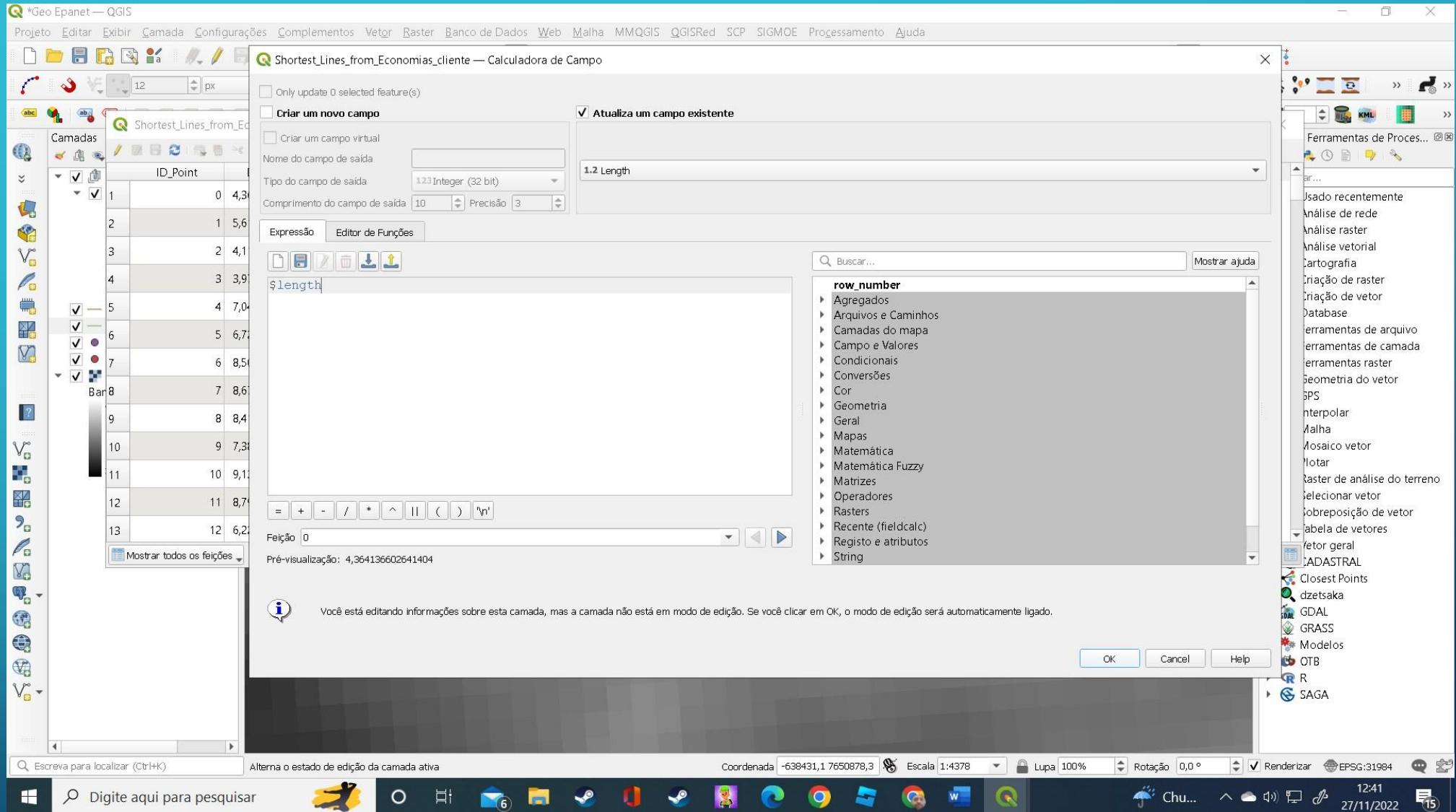


Figura 45 - Digitar: \$Length -> clicar em OK

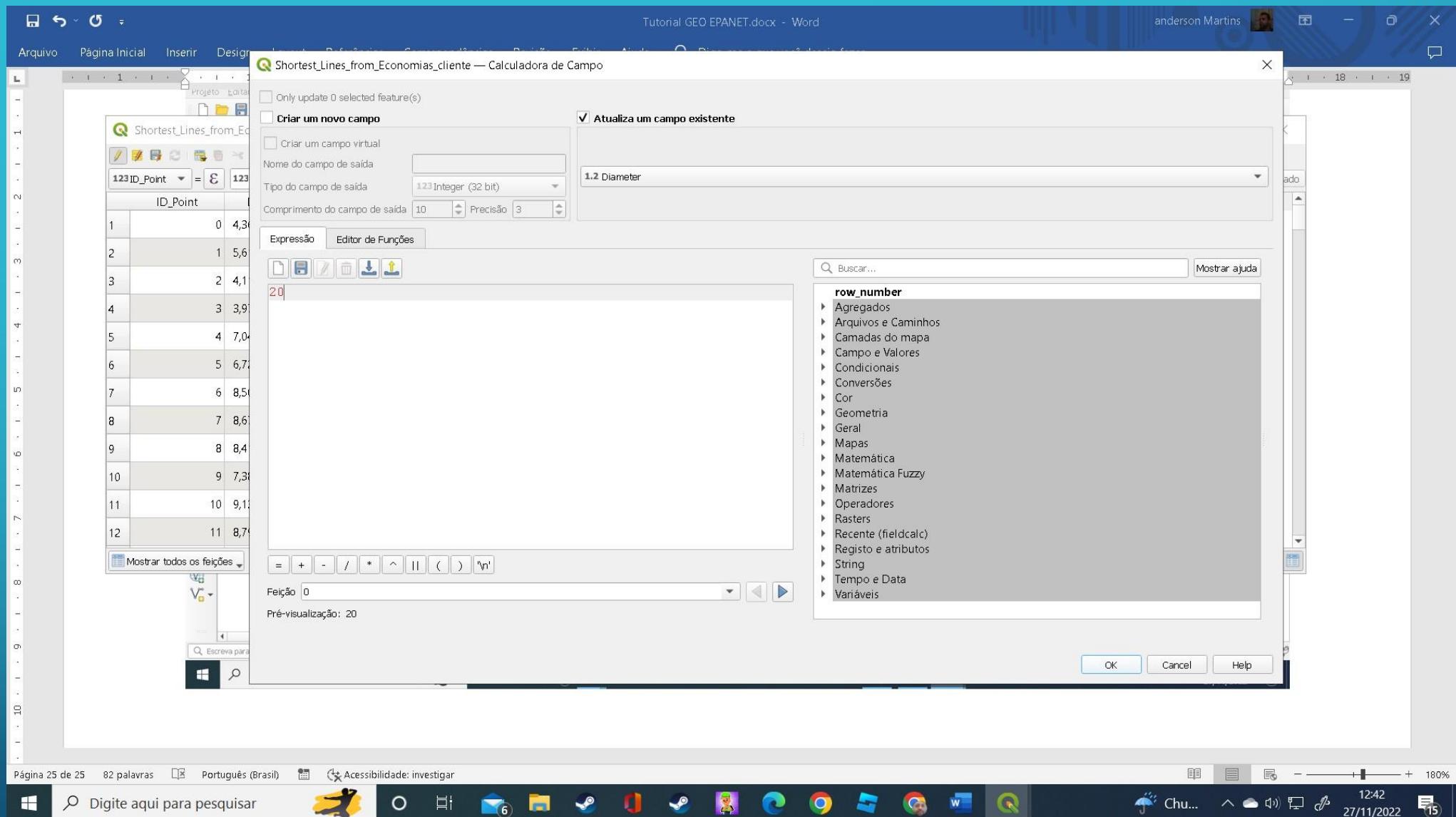


Figura 46 - Alterar o campo diâmetro para 20 -> esses são os ramais prediais

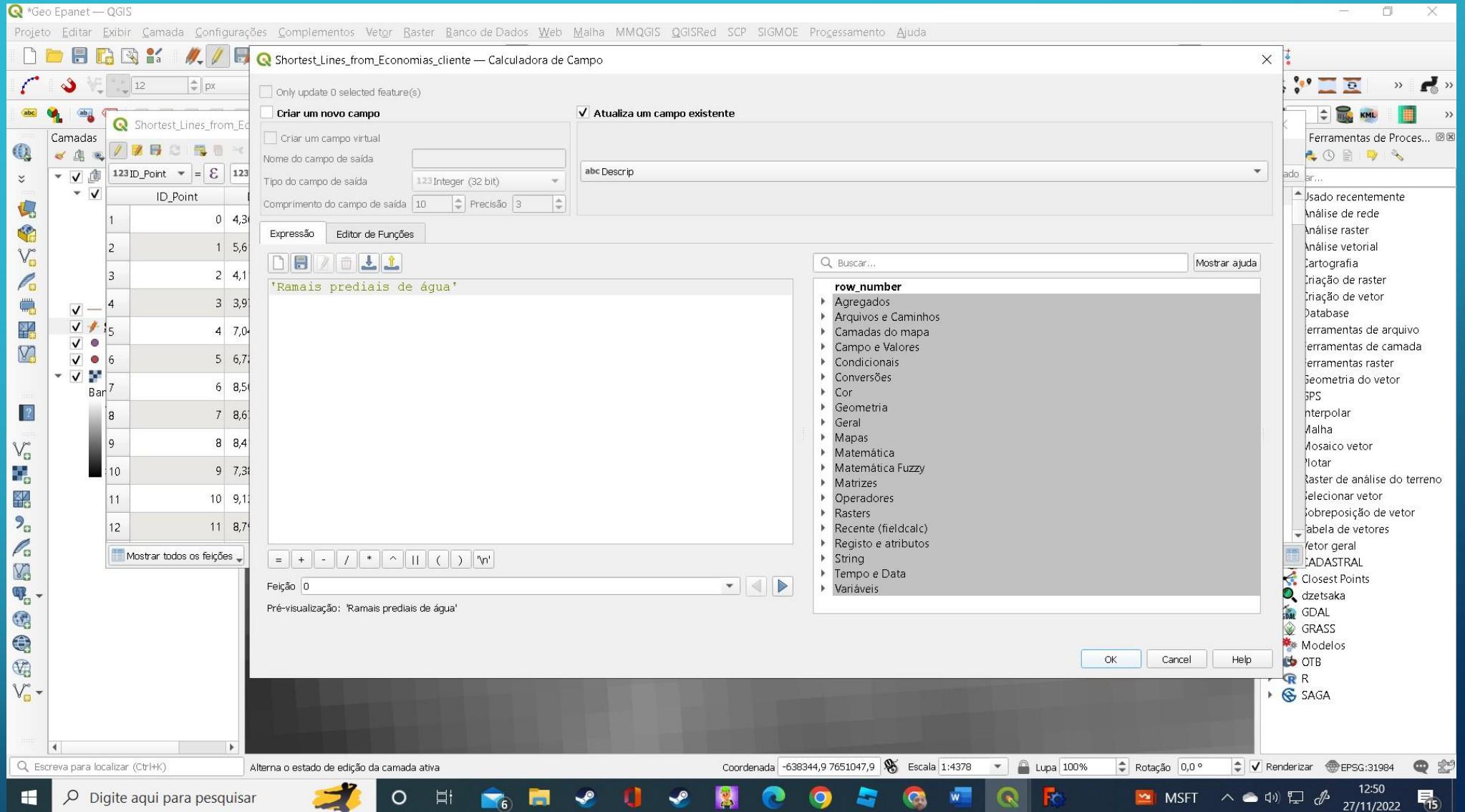
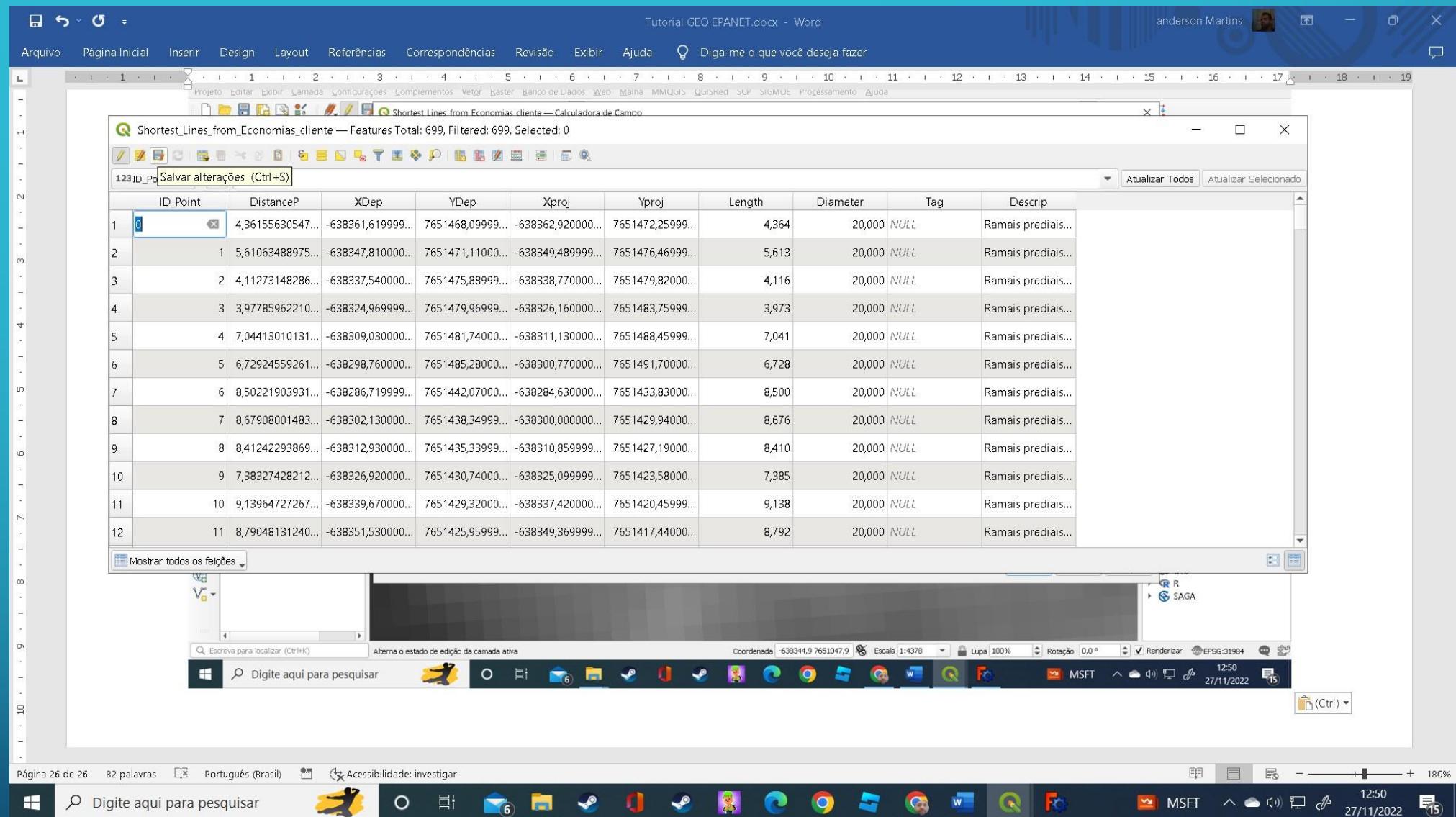


Figura 47 - Atualizar o campo "Descrip" com o texto: 'Ramais prediais de água'



Repetir os passos da criação dos campos da tabela de atributos para a camada dividir

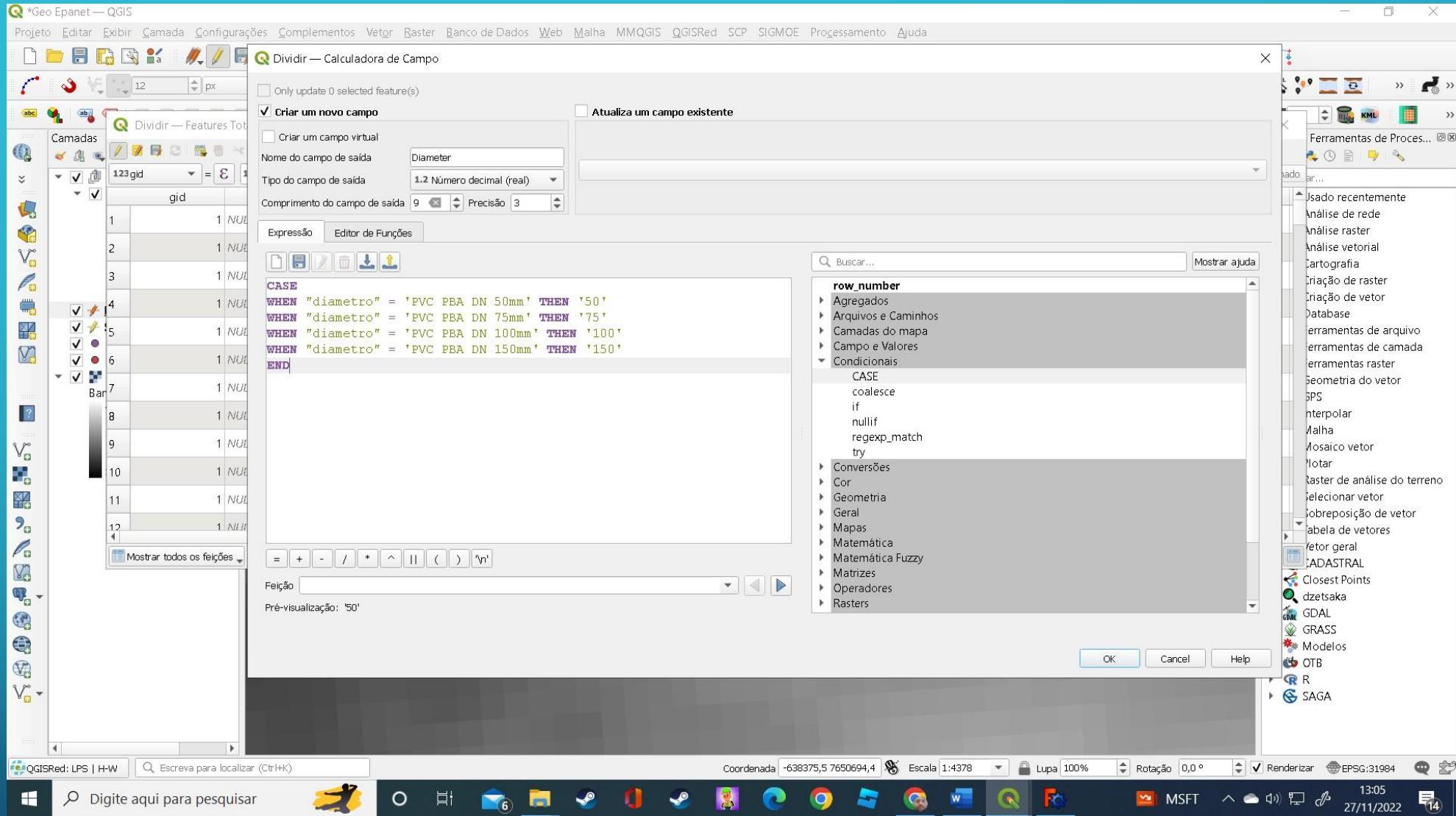


Figura 48 - Um exemplo de criação do campo "Diameter" na camada "dividir" utilizando a condicional CASE que preenche a informação do campo caso o texto do campo diâmetro seja igual ao utilizado na comparação: When = Quando -> Then = Então

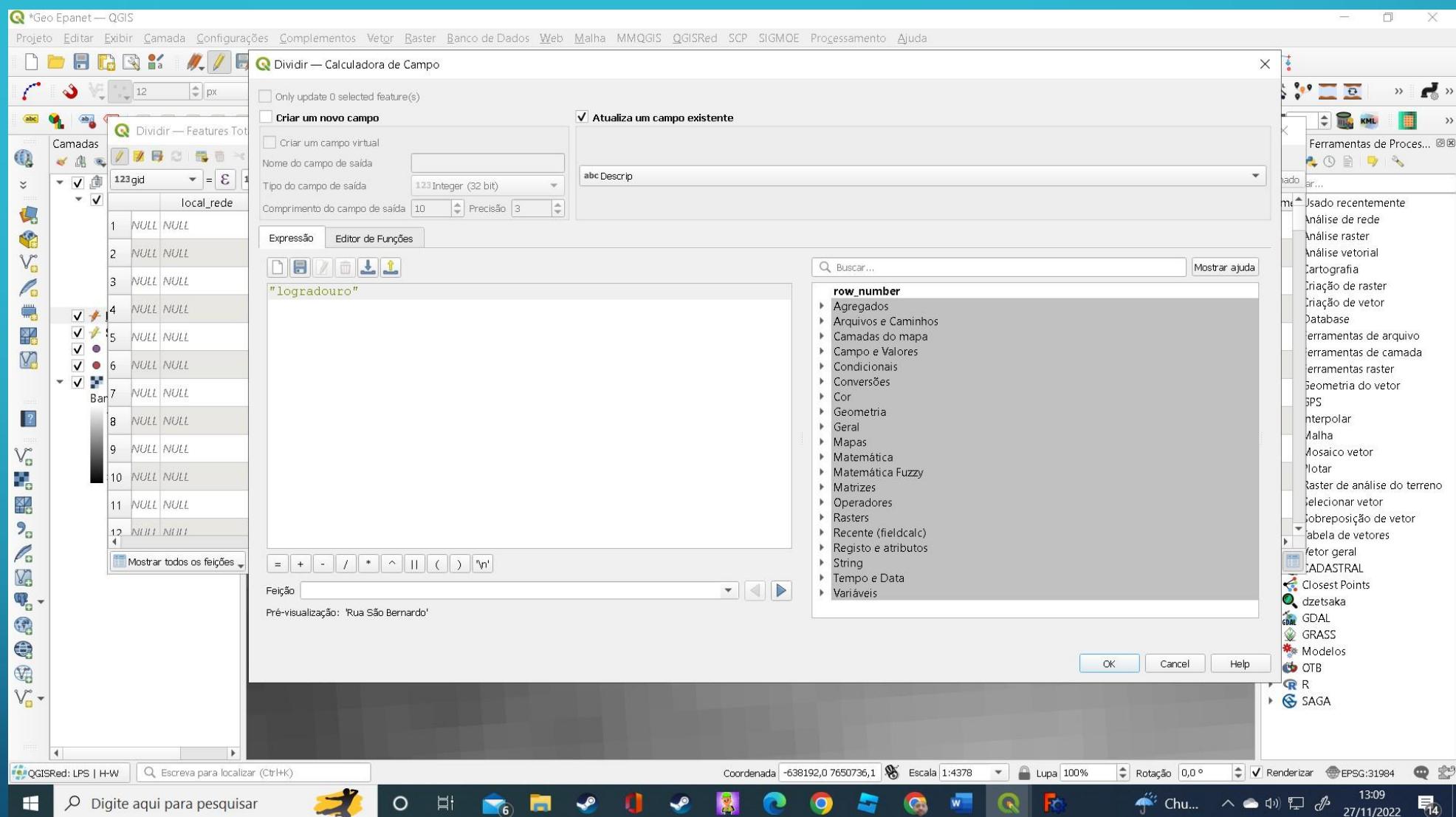


Figura 49 - Atualizando o campo *Descrip* com o texto do campo "logradouro"

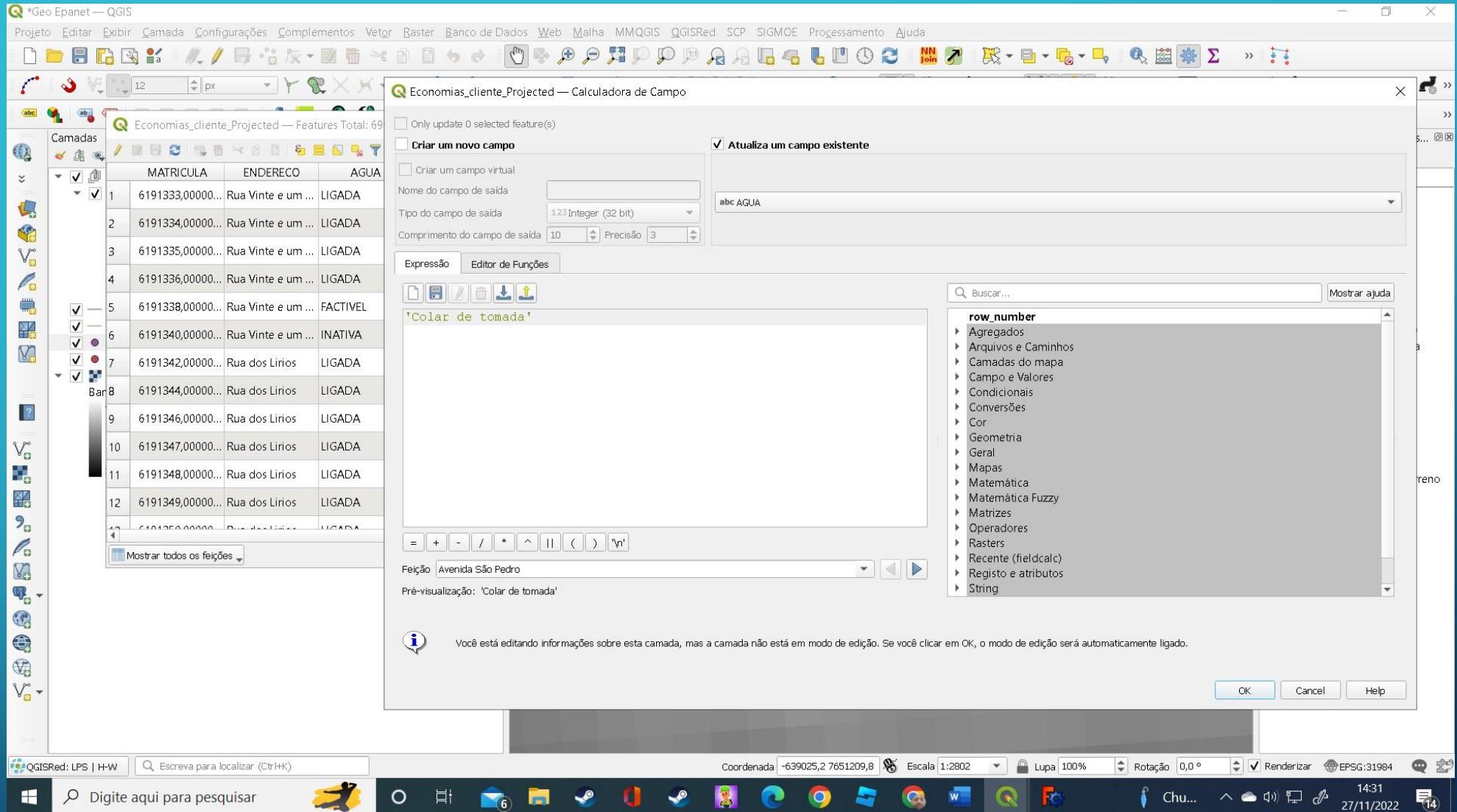
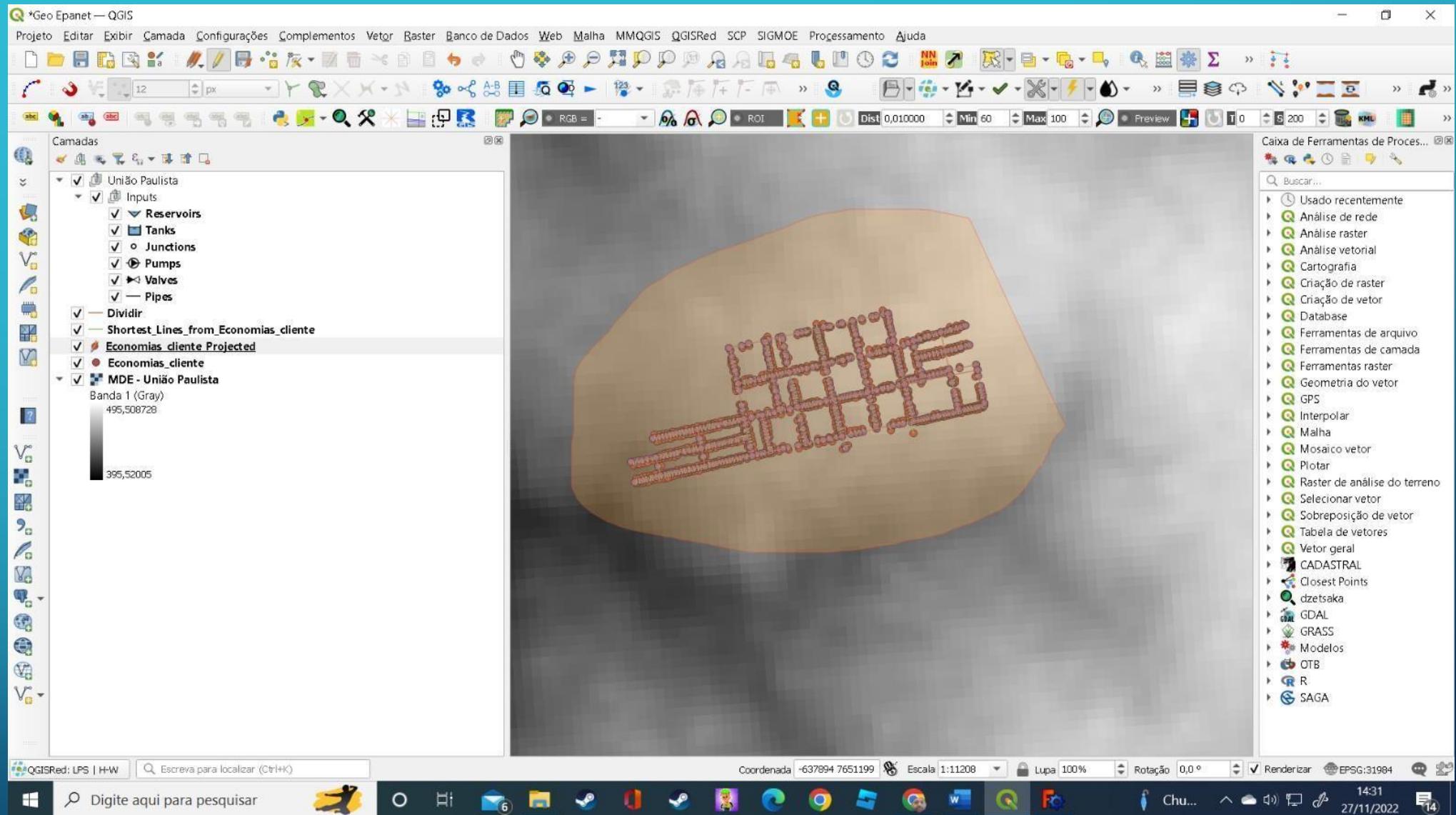


Figura 50 - Atualizar o texto do campo "Agua" da camada "Economias_cliente_projected para 'Colar de tomada'



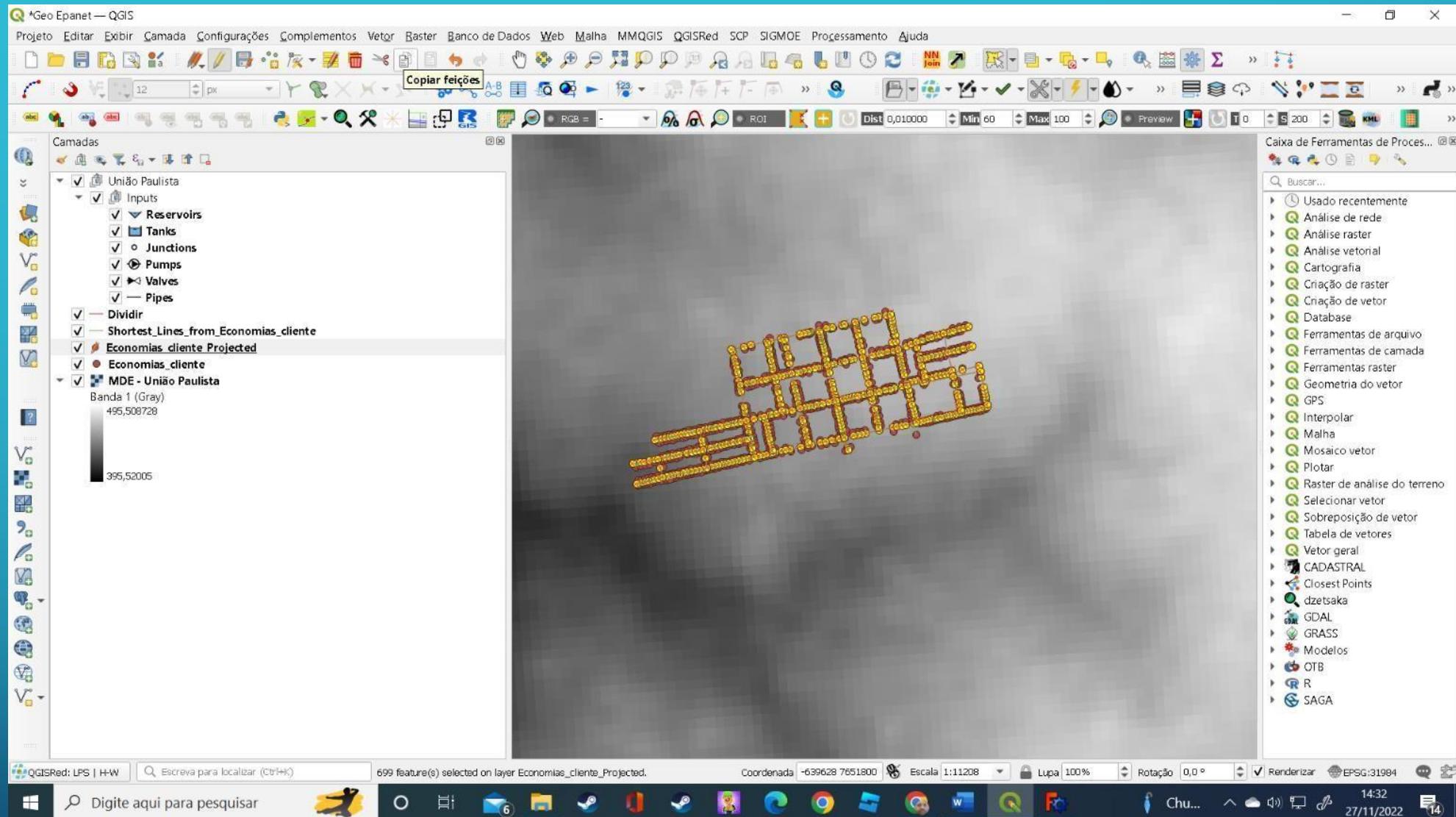


Figura 51 - Copiar os pontos da camada "Economias_cliente_projected" para a camada "Economias_cliente"

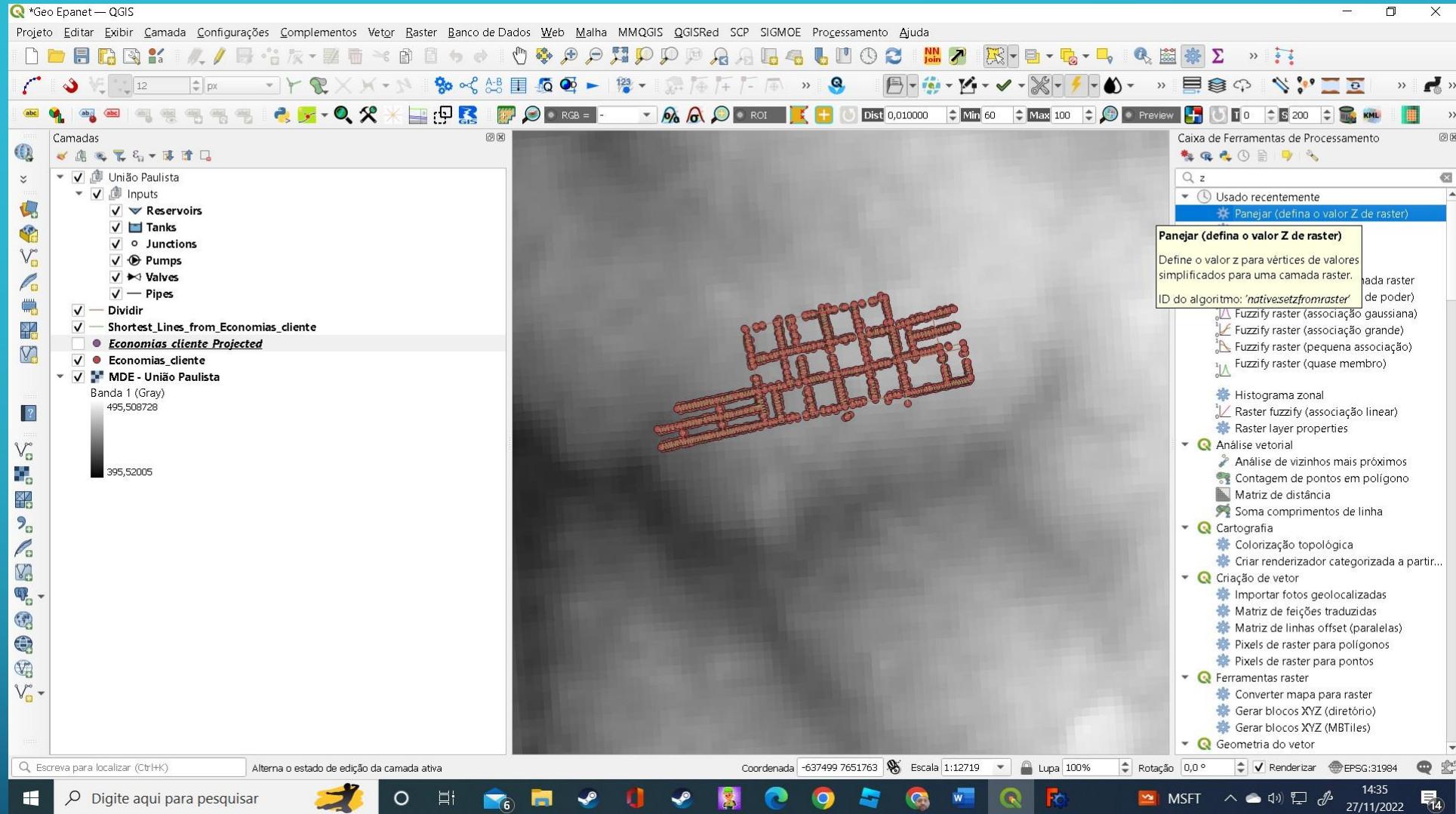


Figura 52 - Selecionar a ferramenta "Planejar c(defina o valor de Z de raster)

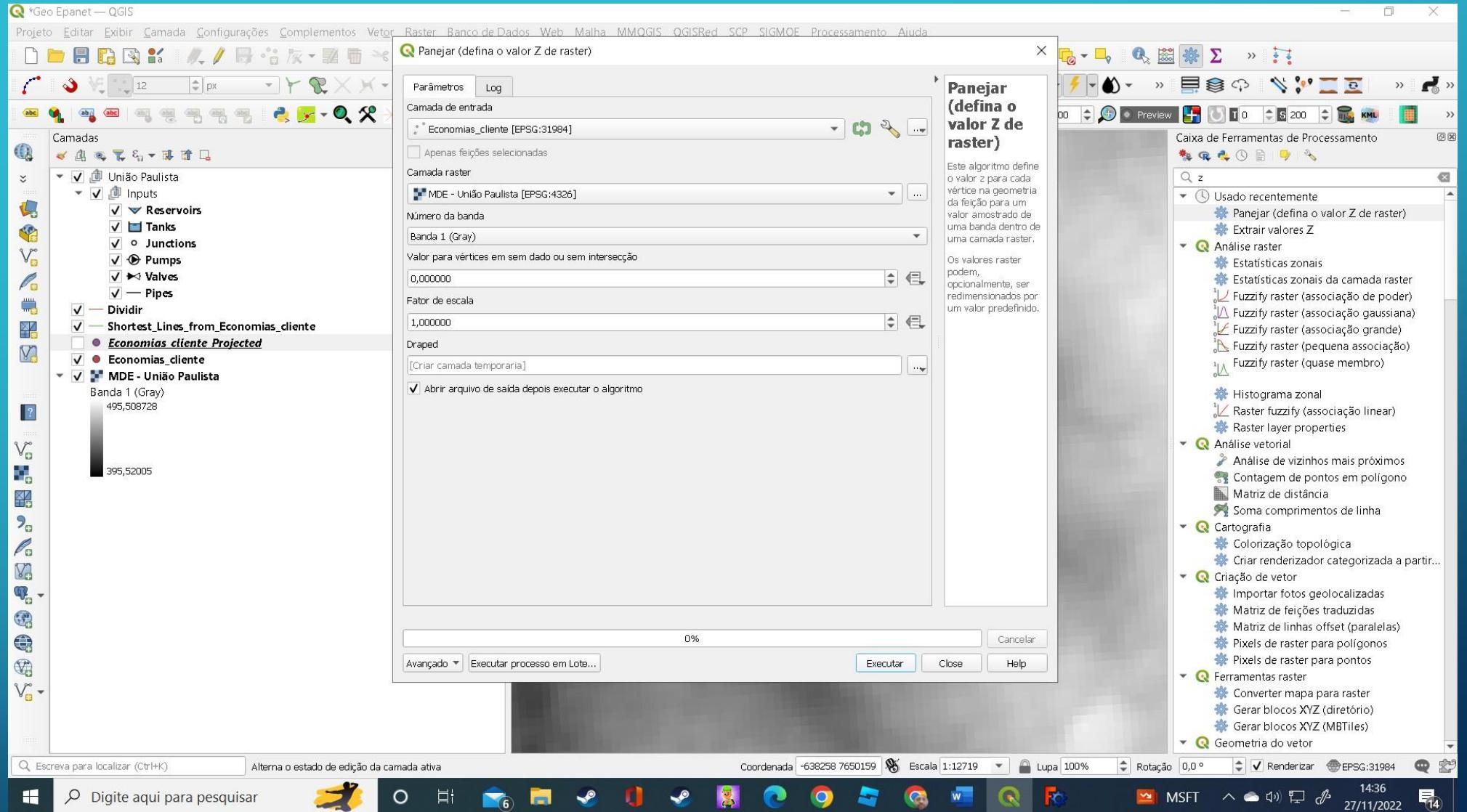


Figura 53 - Selecionar *Economias_cliente* -> *MDE - União Paulista* -> clicar em "executar"

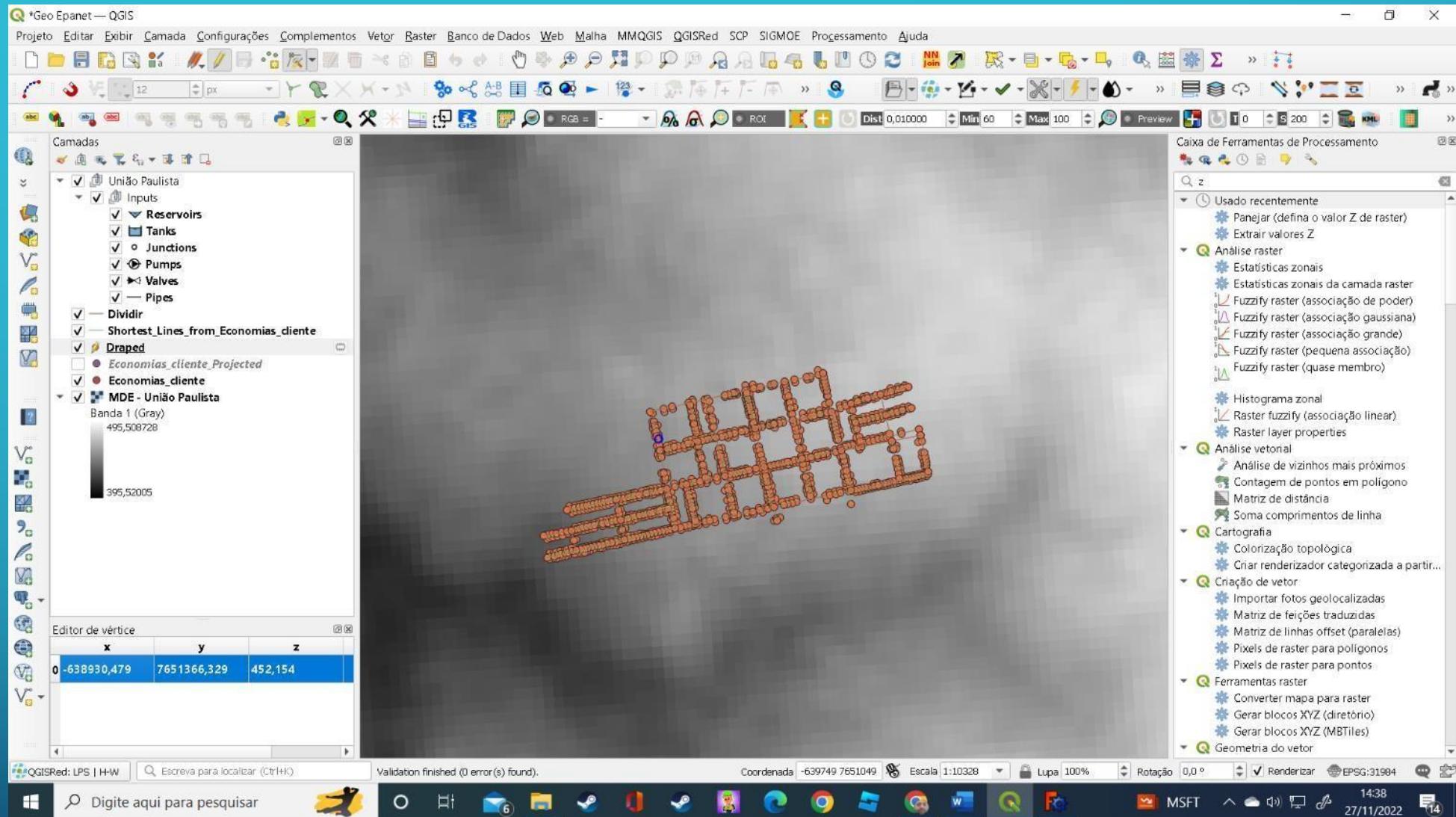


Figura 54 - O produto é a camada "Draped" que contém os valores de elevação "Cotas"

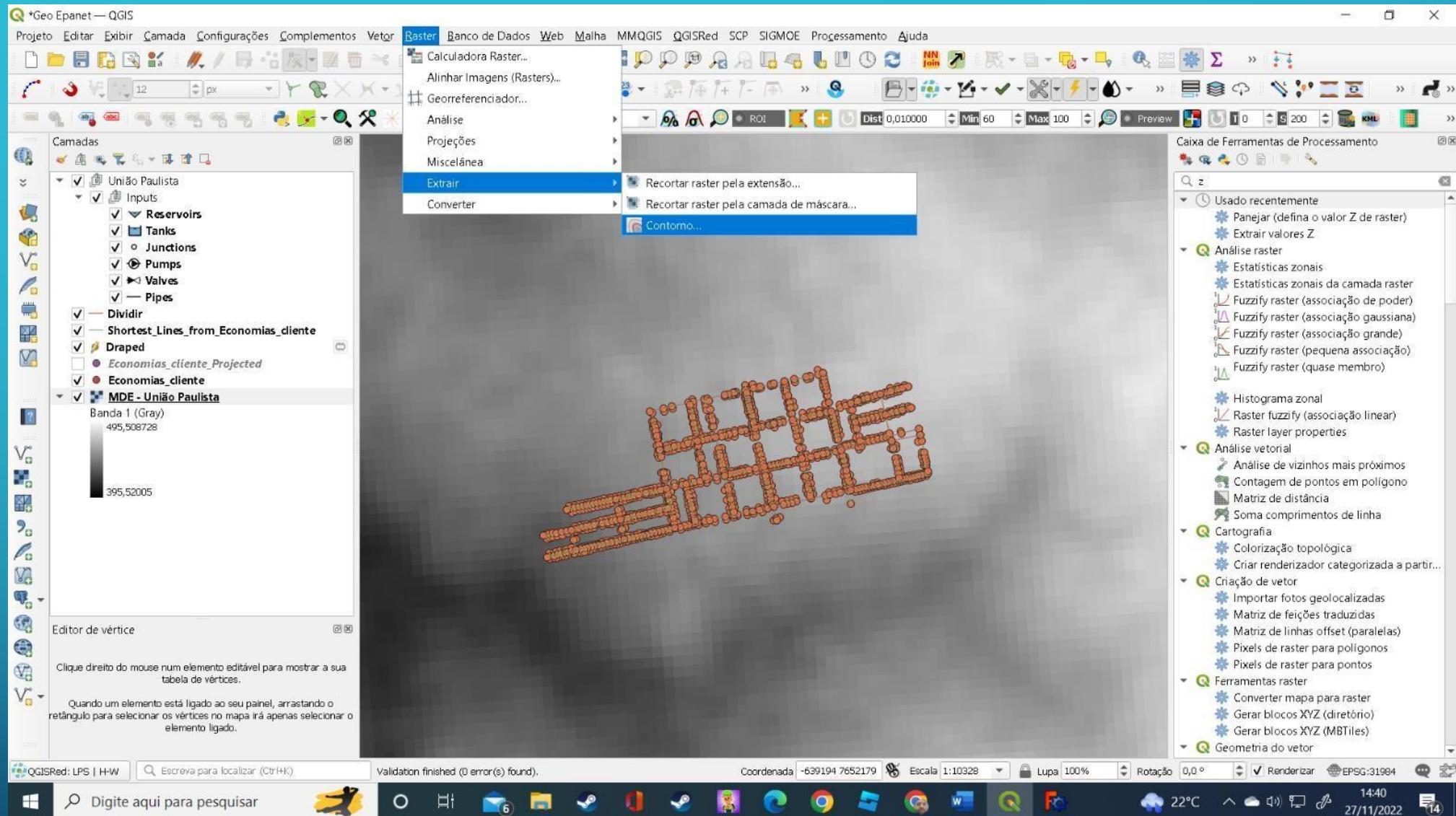


Figura 55- Uma lição extra de como gerar curvas de nível com o MDE – Clicar no menu Raster -> Extrair -> Contorno...

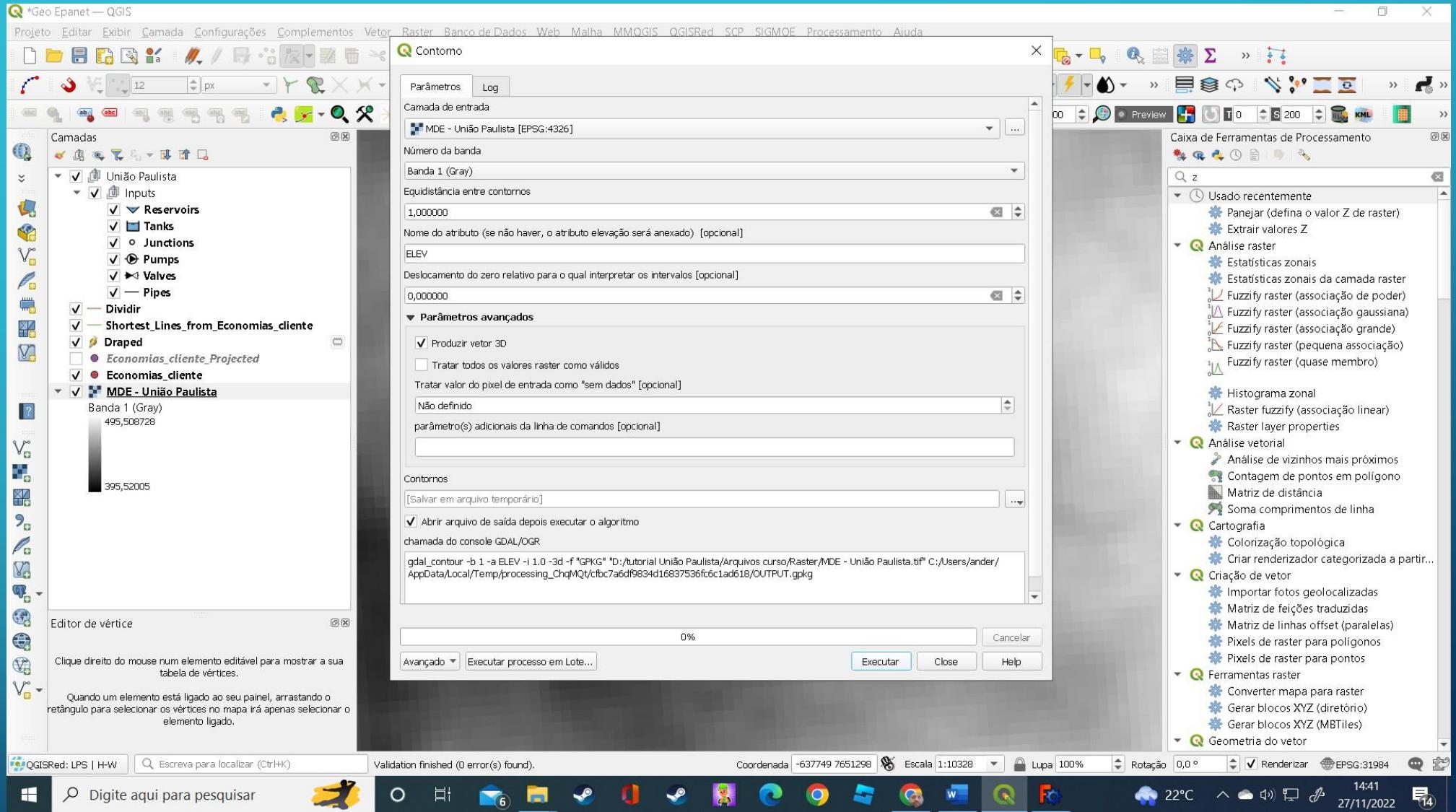


Figura 56 - Selecionar a camada de entrada "MDE - União Paulista" -> Equidistância entre contornos "1,000000" -> e marcar o FLAG "Producir vetor em 3d" -> executar

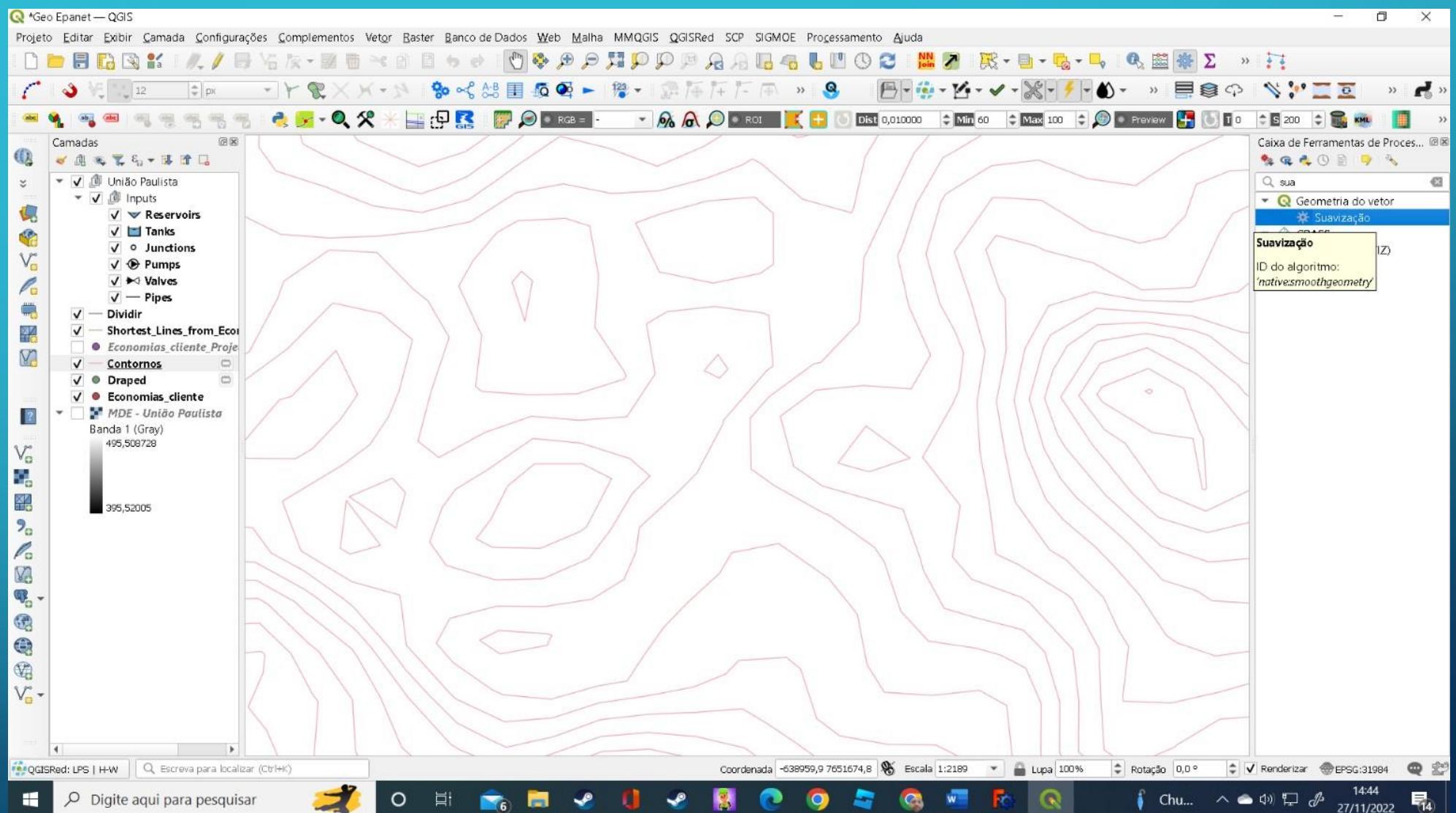


Figura 57 - As linhas ficam quadradas -> Vamos selecionar a ferramenta "Suavização"

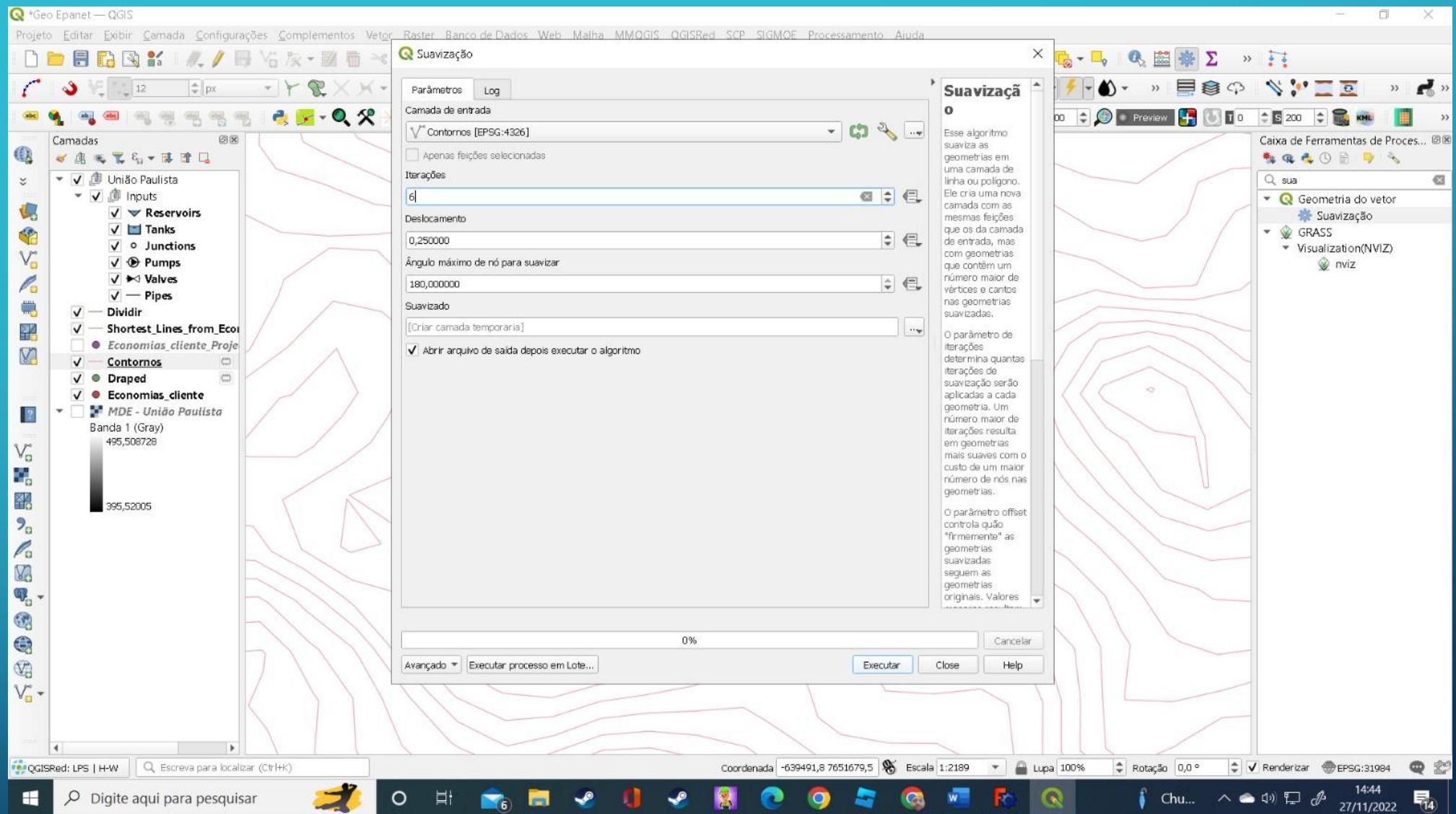


Figura 58- Selecione na camada de entrada "Contornos" -> iterações "6" -> executar

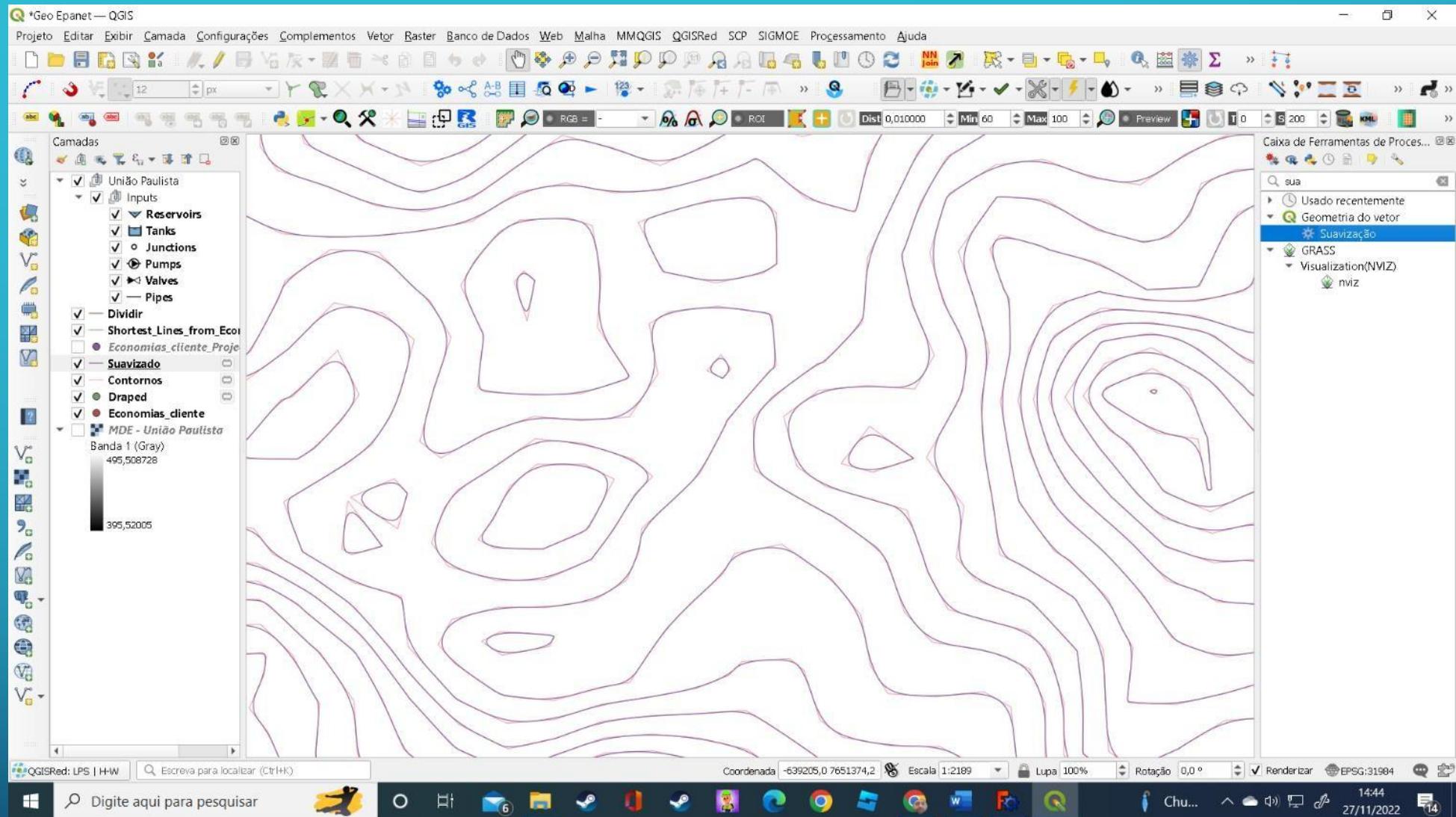


Figura 59 - Observe as linhas arredondadas

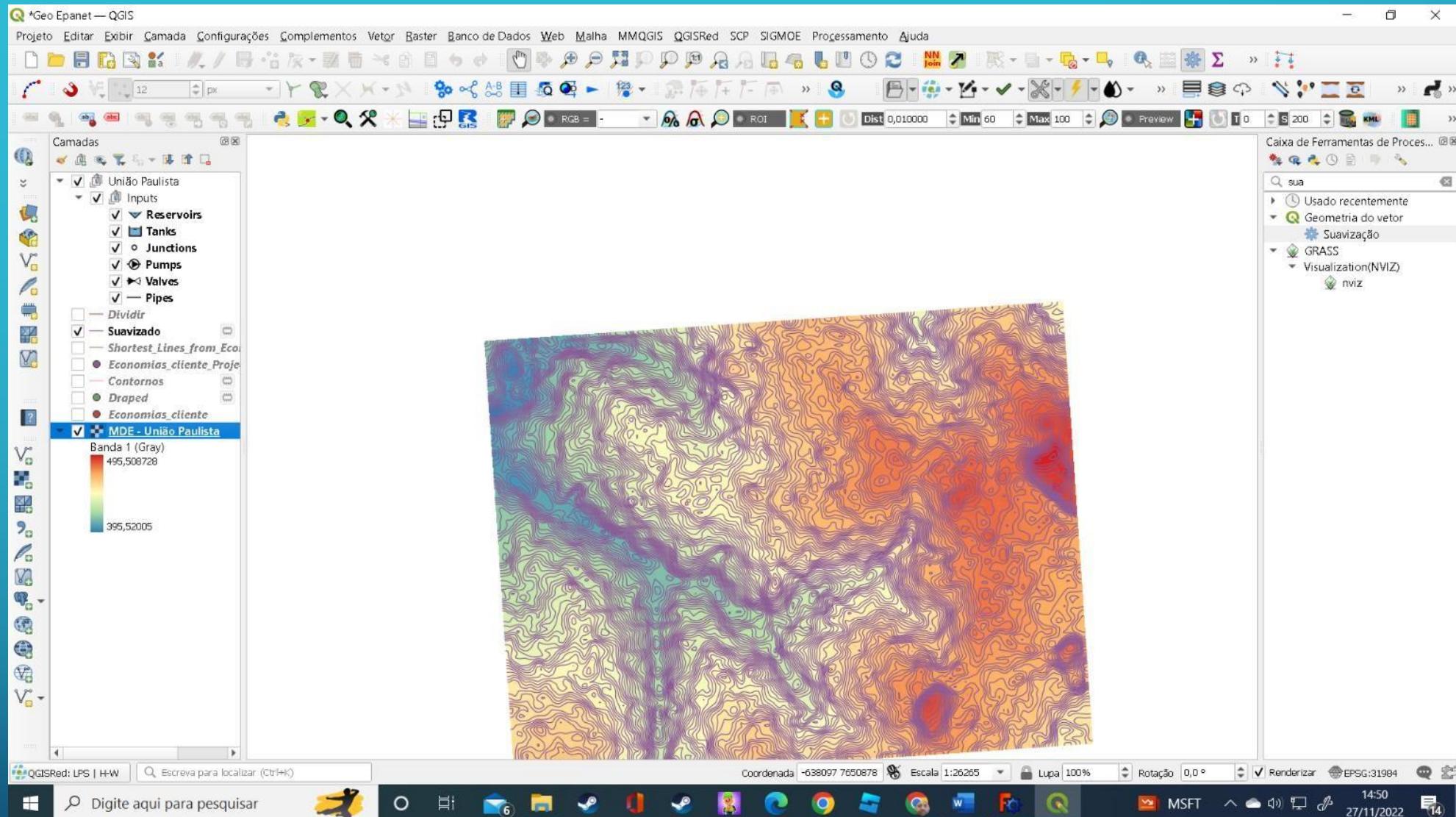


Figura 60 - Observe as curvas de nível sobre o MDE utilizando uma graduação de cores.

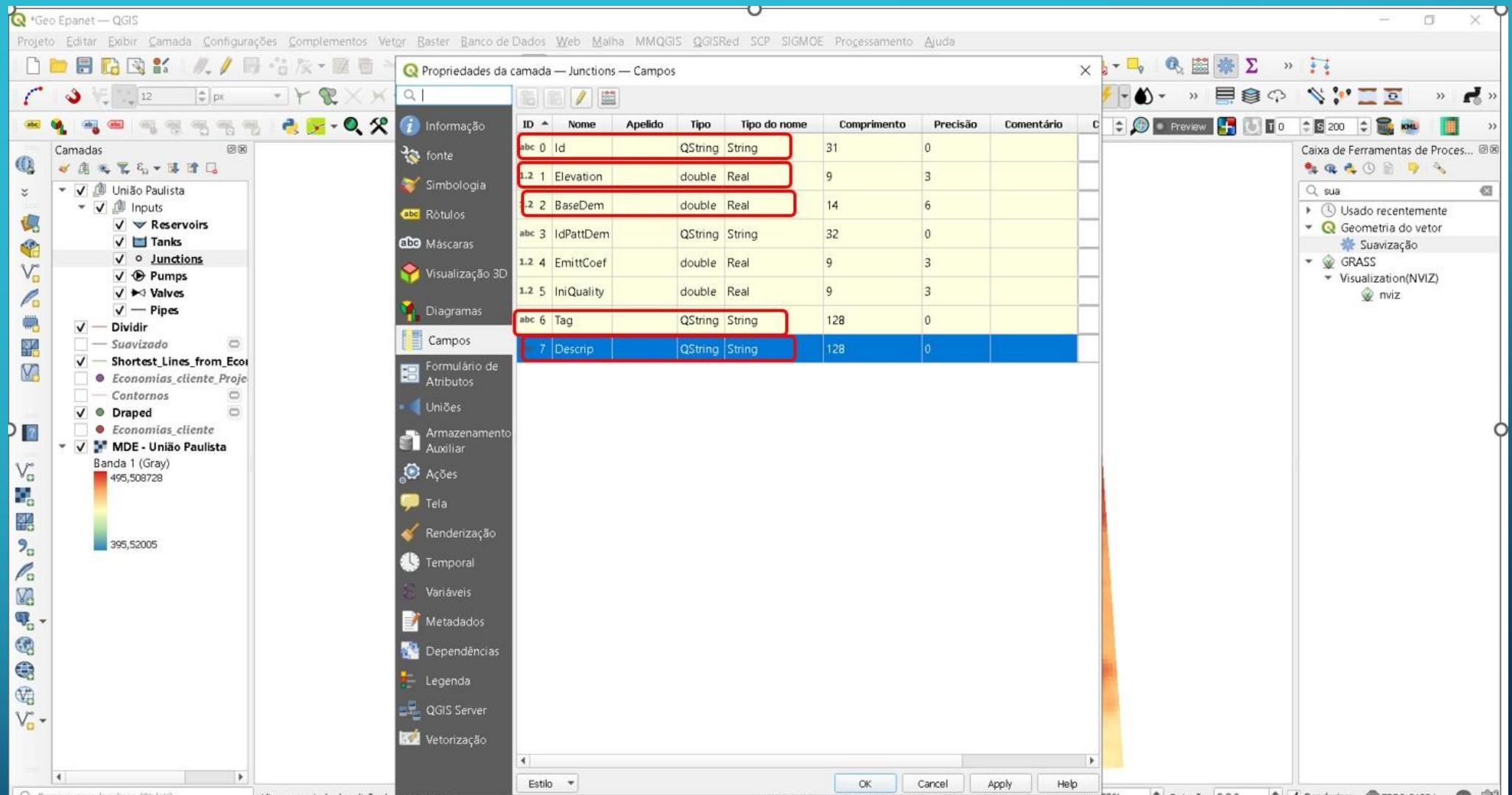


Figura 61- Criar esses campos na camada "Economias_cliente"

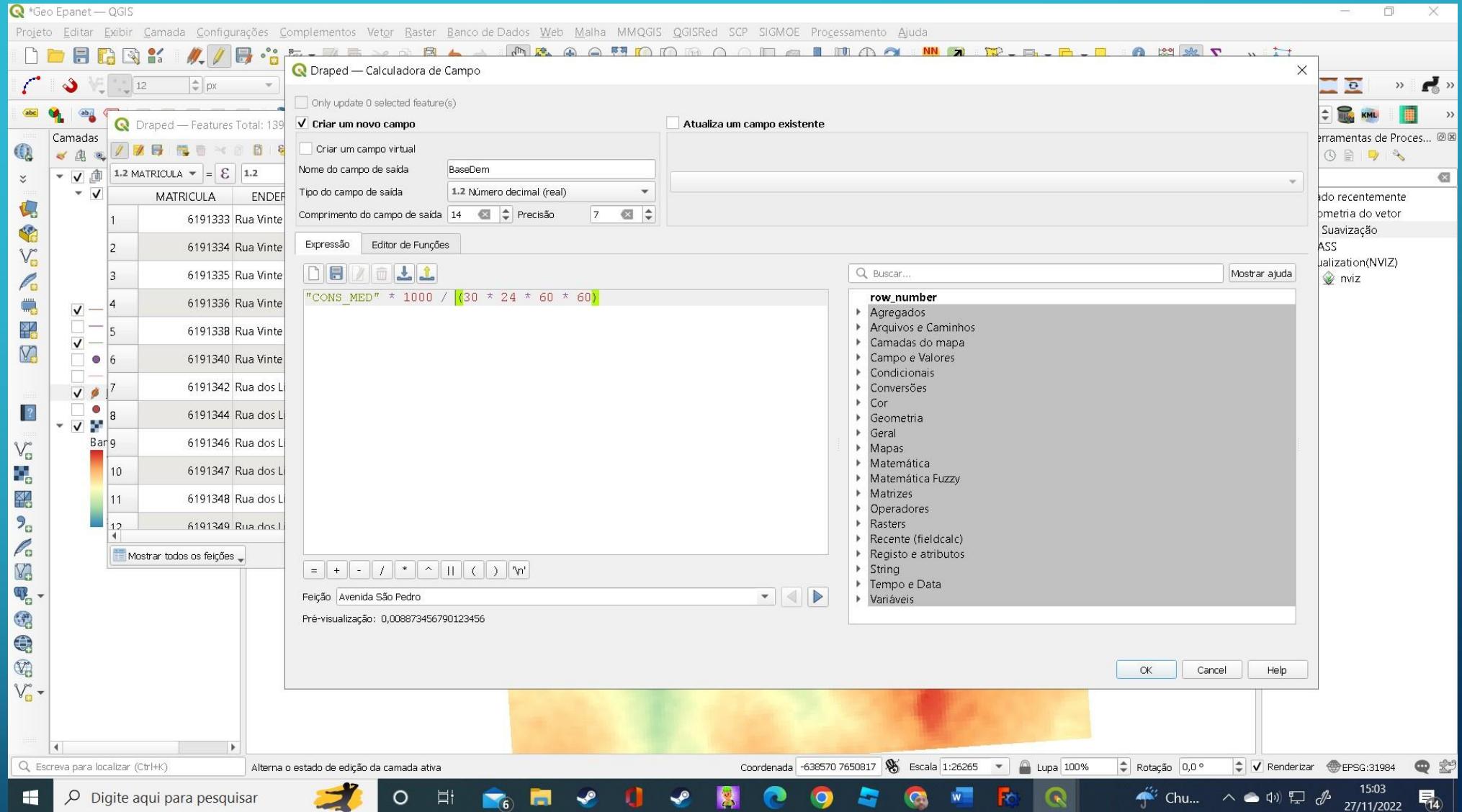


Figura 62- Criar o campo "BaseDem" com a expressão que converte o consumo médio em metros cúbicos mês em litros por segundo

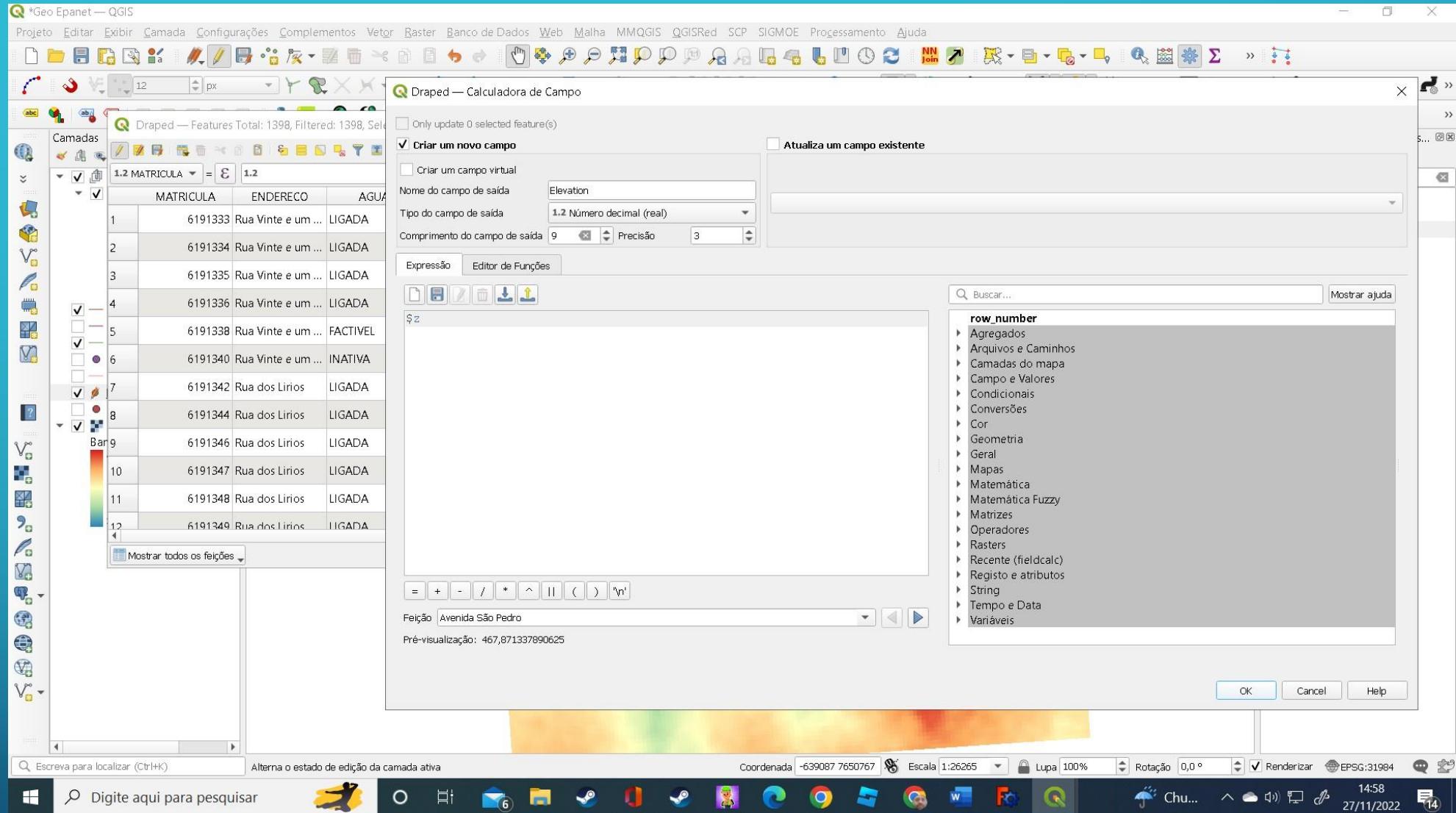


Figura 63- Criar o campo "Elevation" com o valor de "z" gerado na camada.

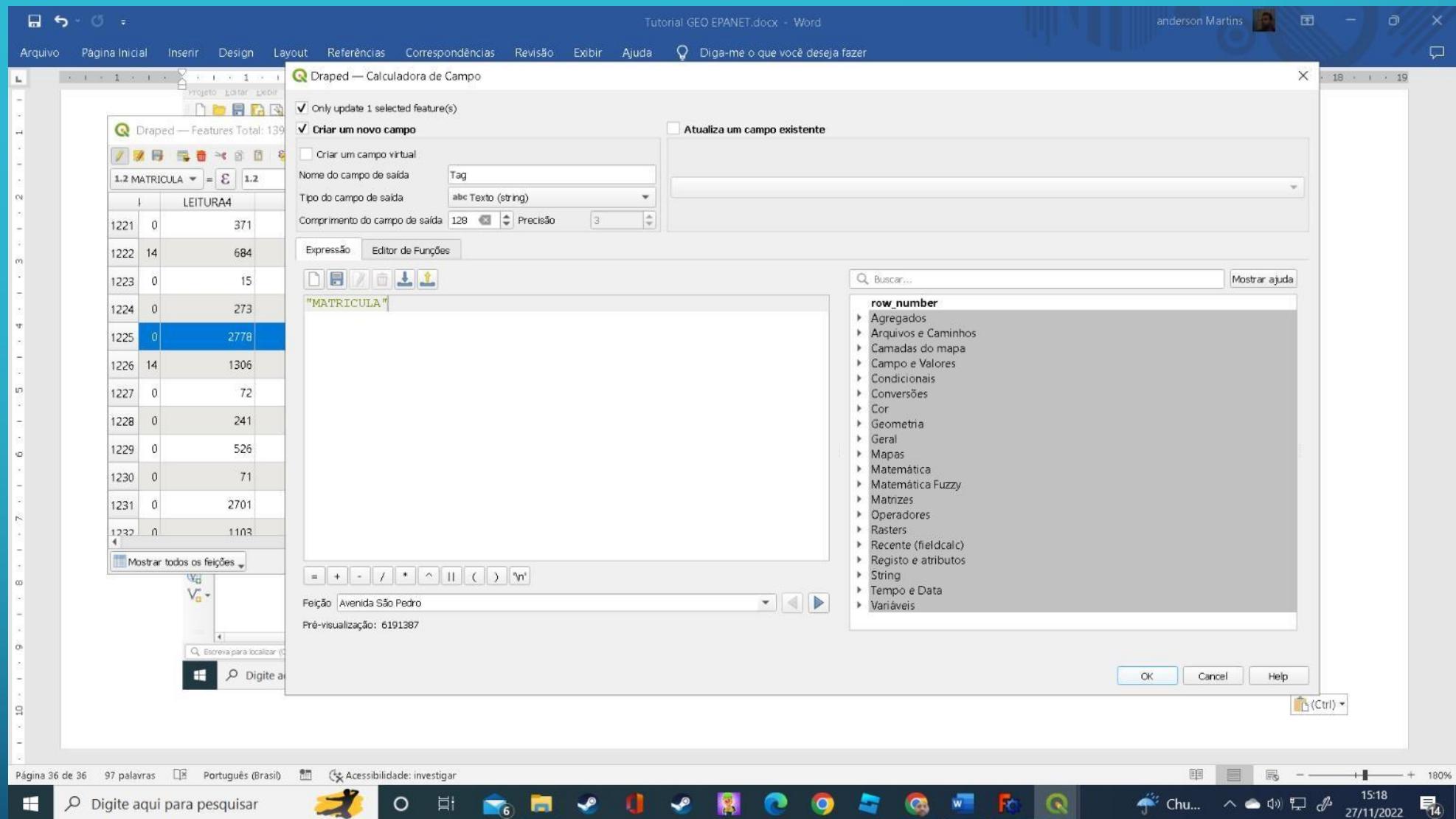


Figura 64 - Criar o campo "Tag" inserindo os números do campo "matricula"

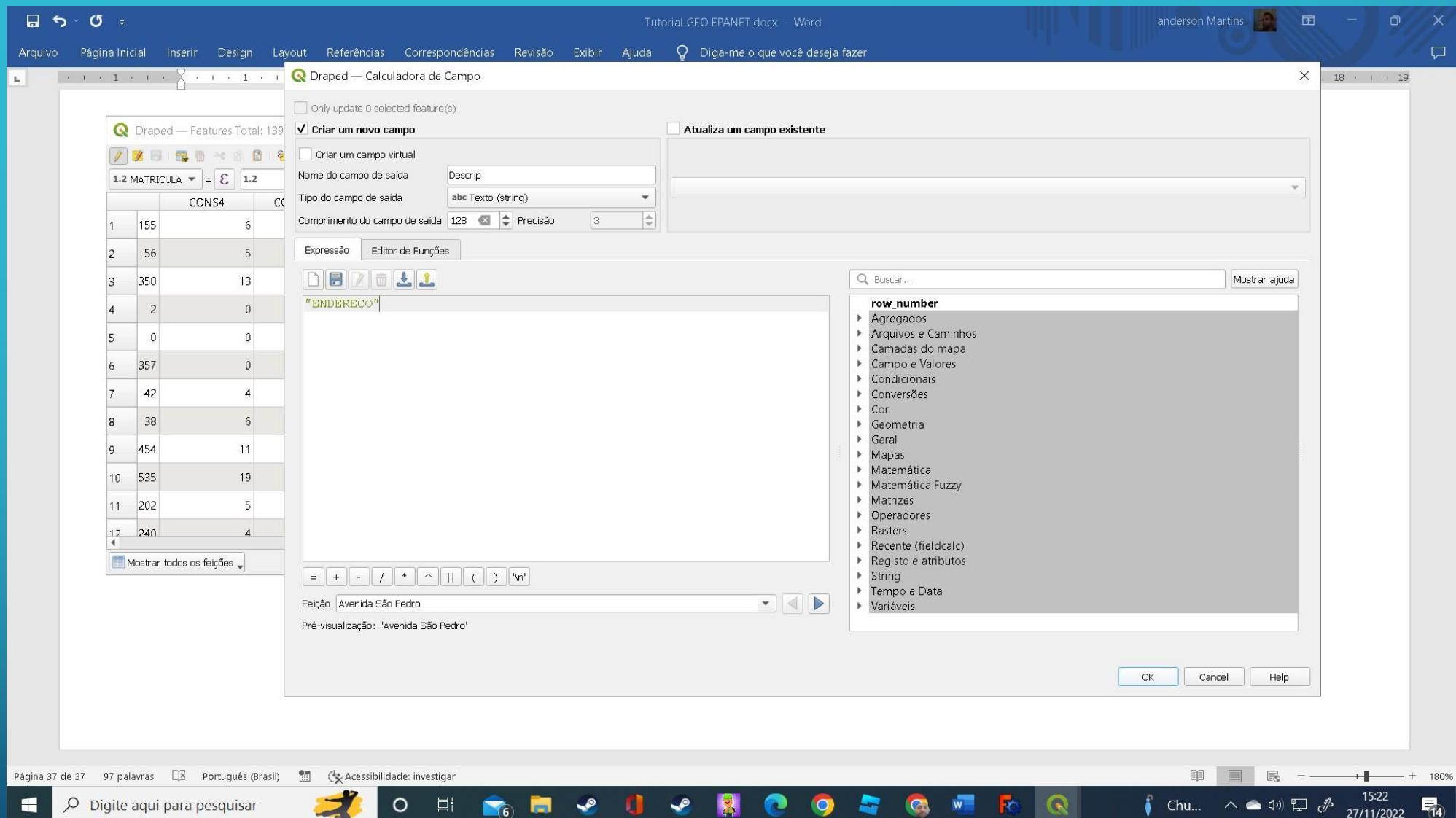


Figura 65- Criar o campo "Descrip" inserindo os textos do campo "endereço"

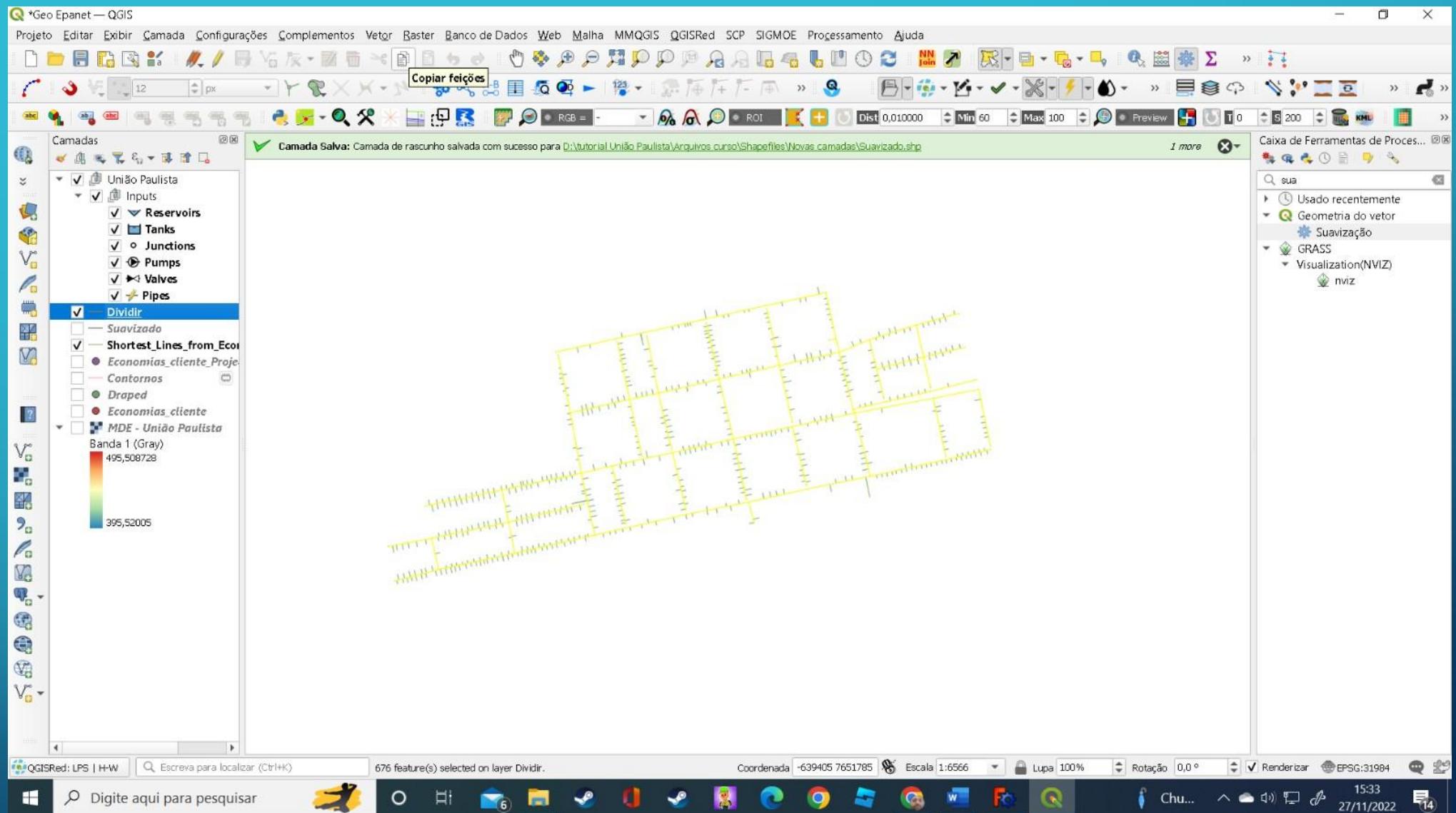


Figura 66 - Selecionar as feições da camada dividir e copiar.

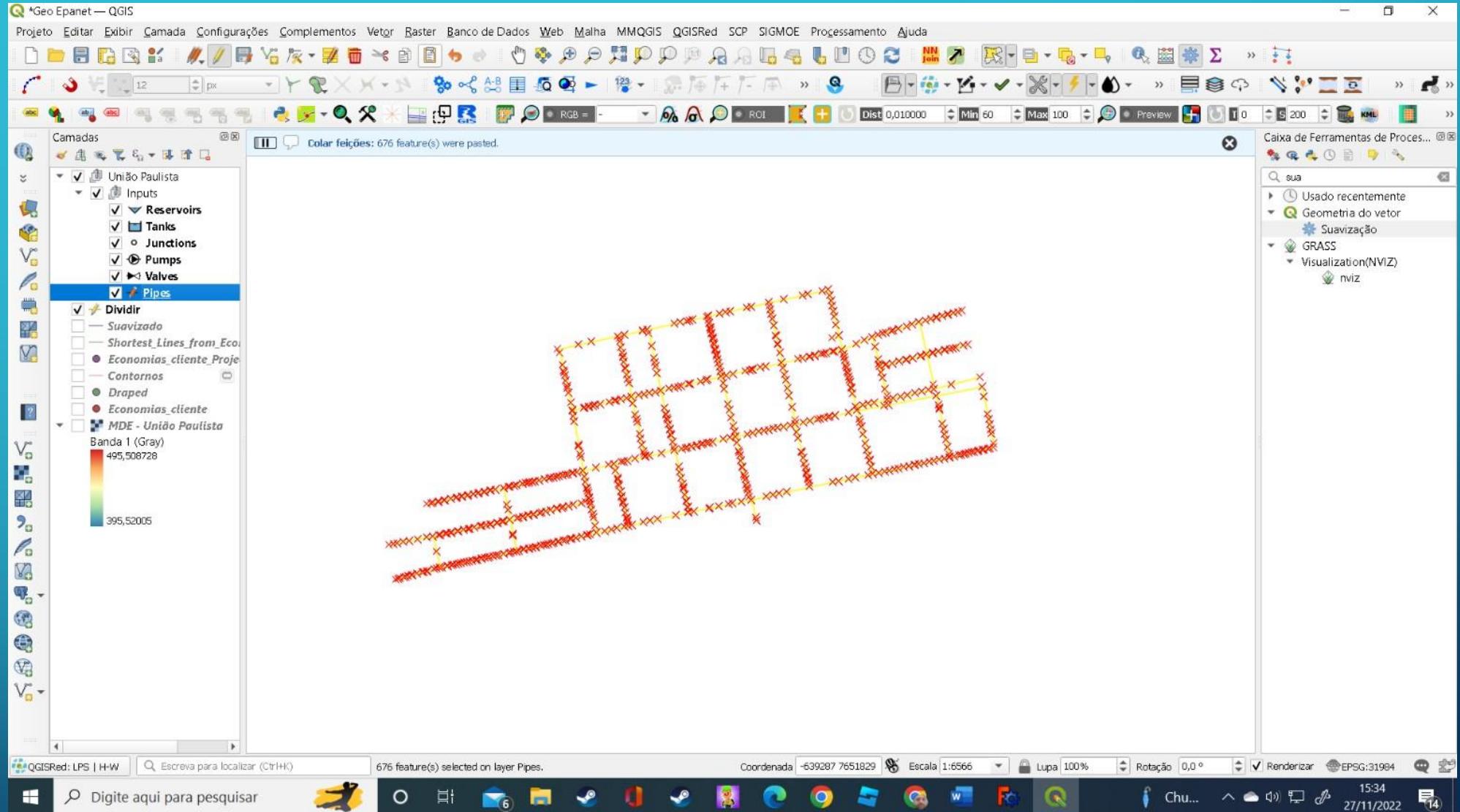


Figura 67 - Colar na camada Pipes

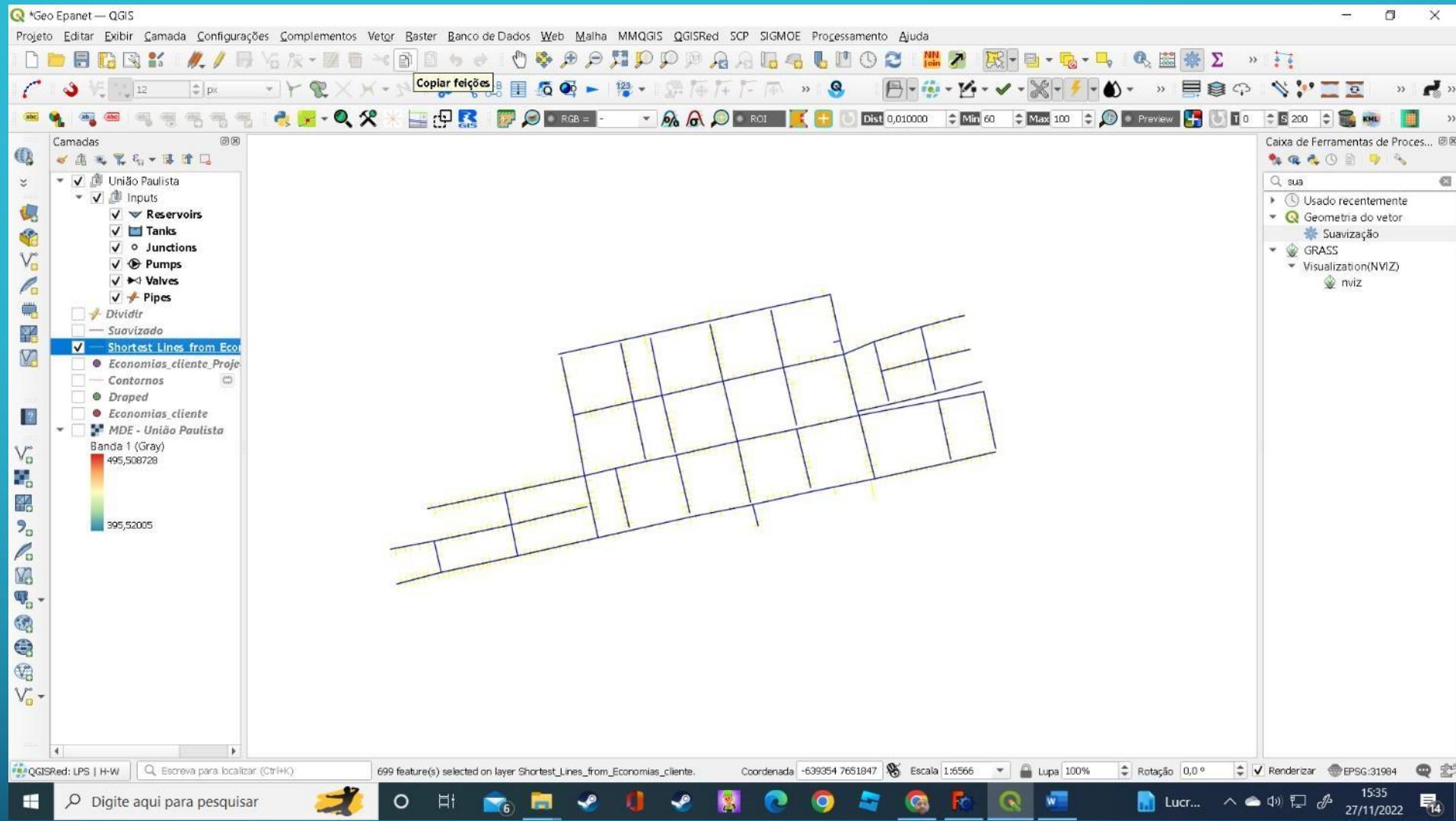


Figura 68 - Selecionar as feições da camada *Shortest lines from..* e colar na camada *Pipes*

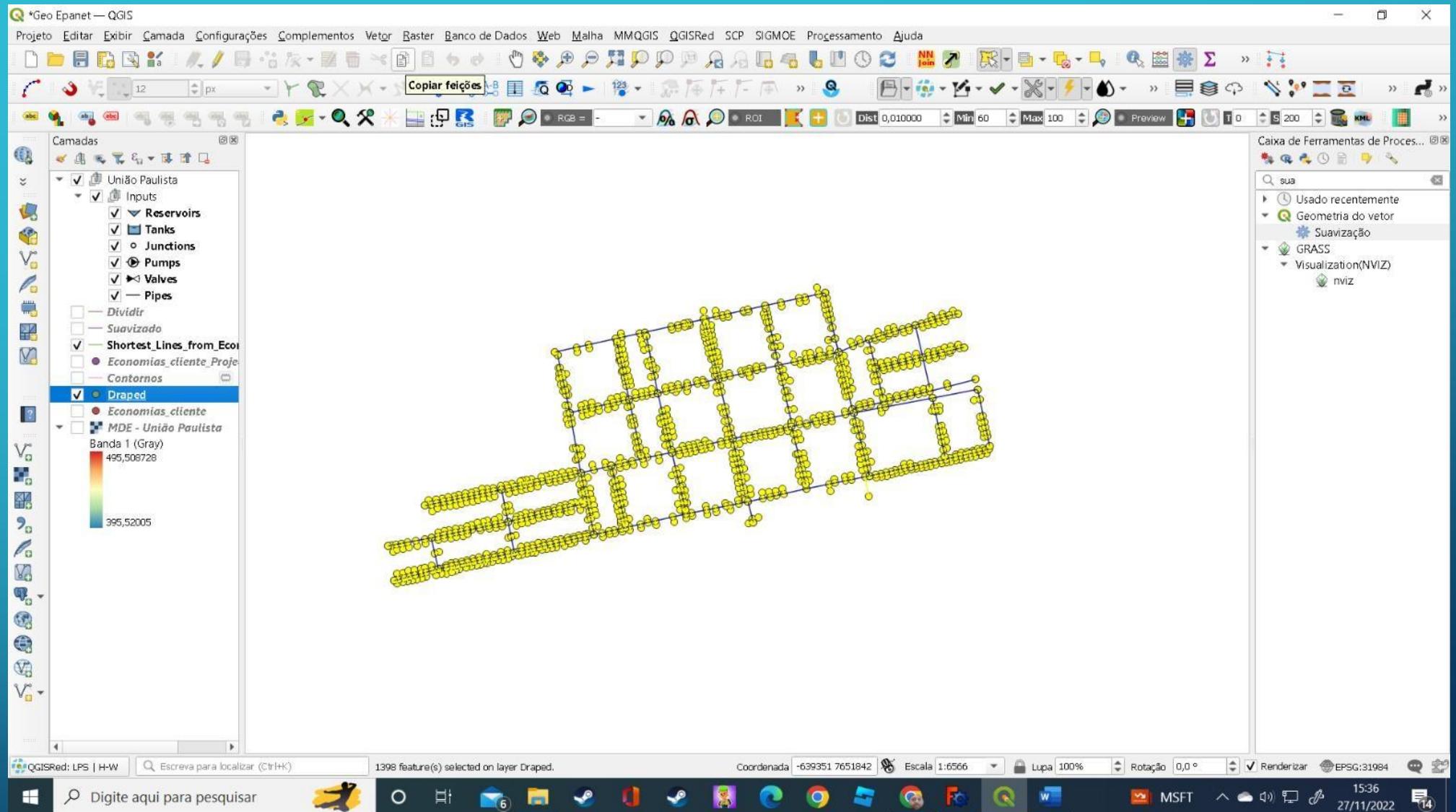


Figura 69 - Copiar as feições da camada Draped e colar na camada "Junctions"

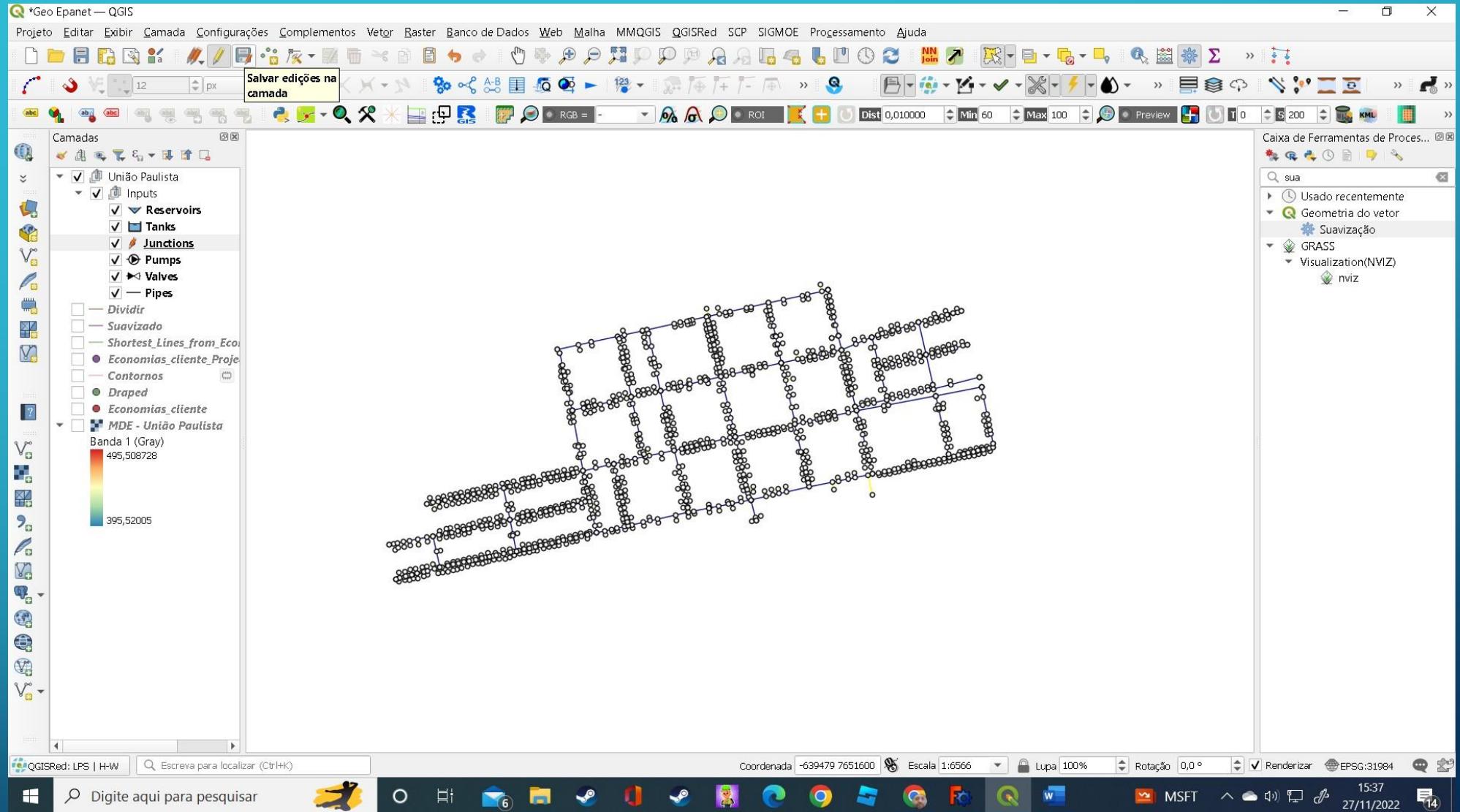


Figura 70 - O modelo está pronto -> inserir reservatórios, bombas, válvulas ETC

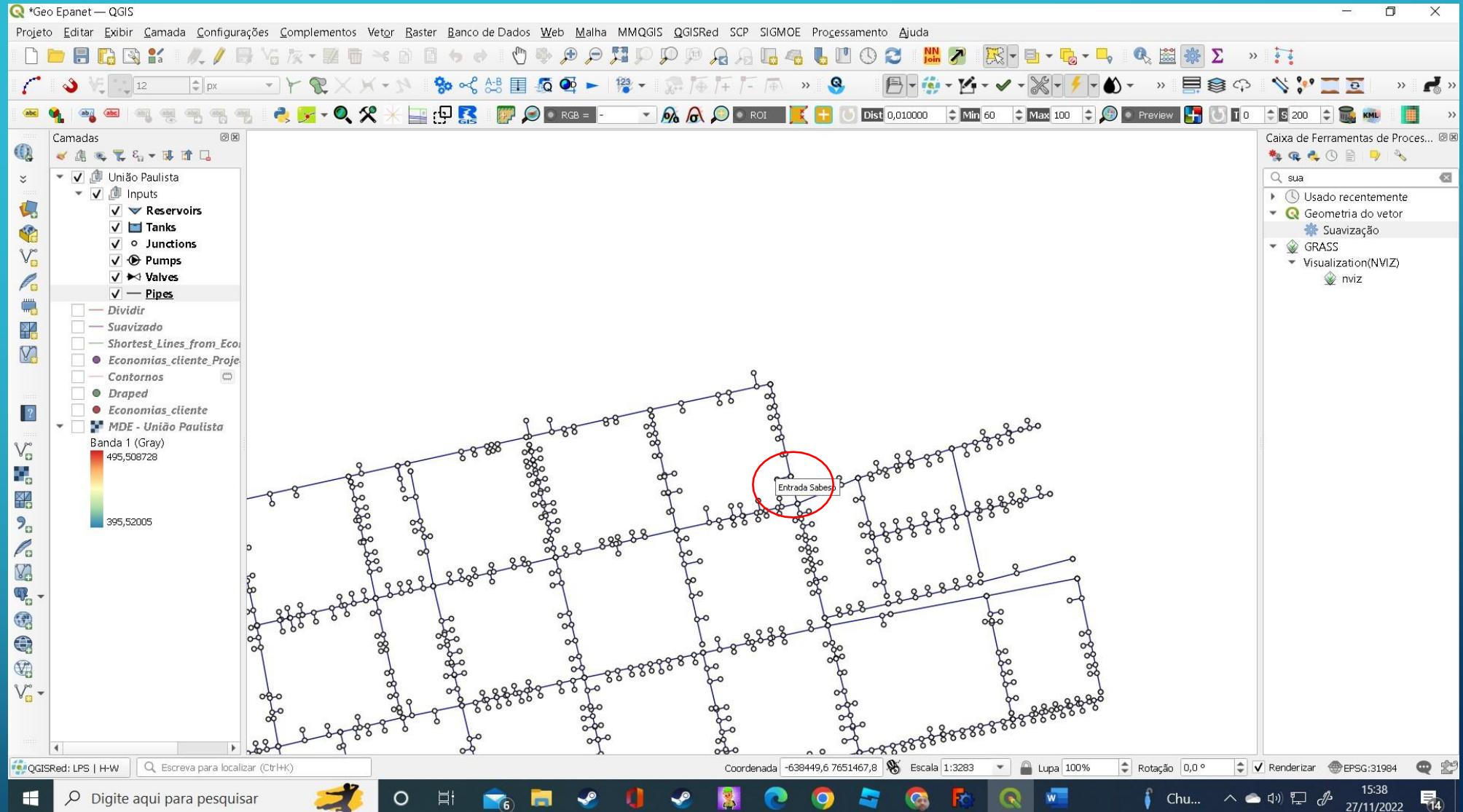


Figura 71 - ETA Sabesp

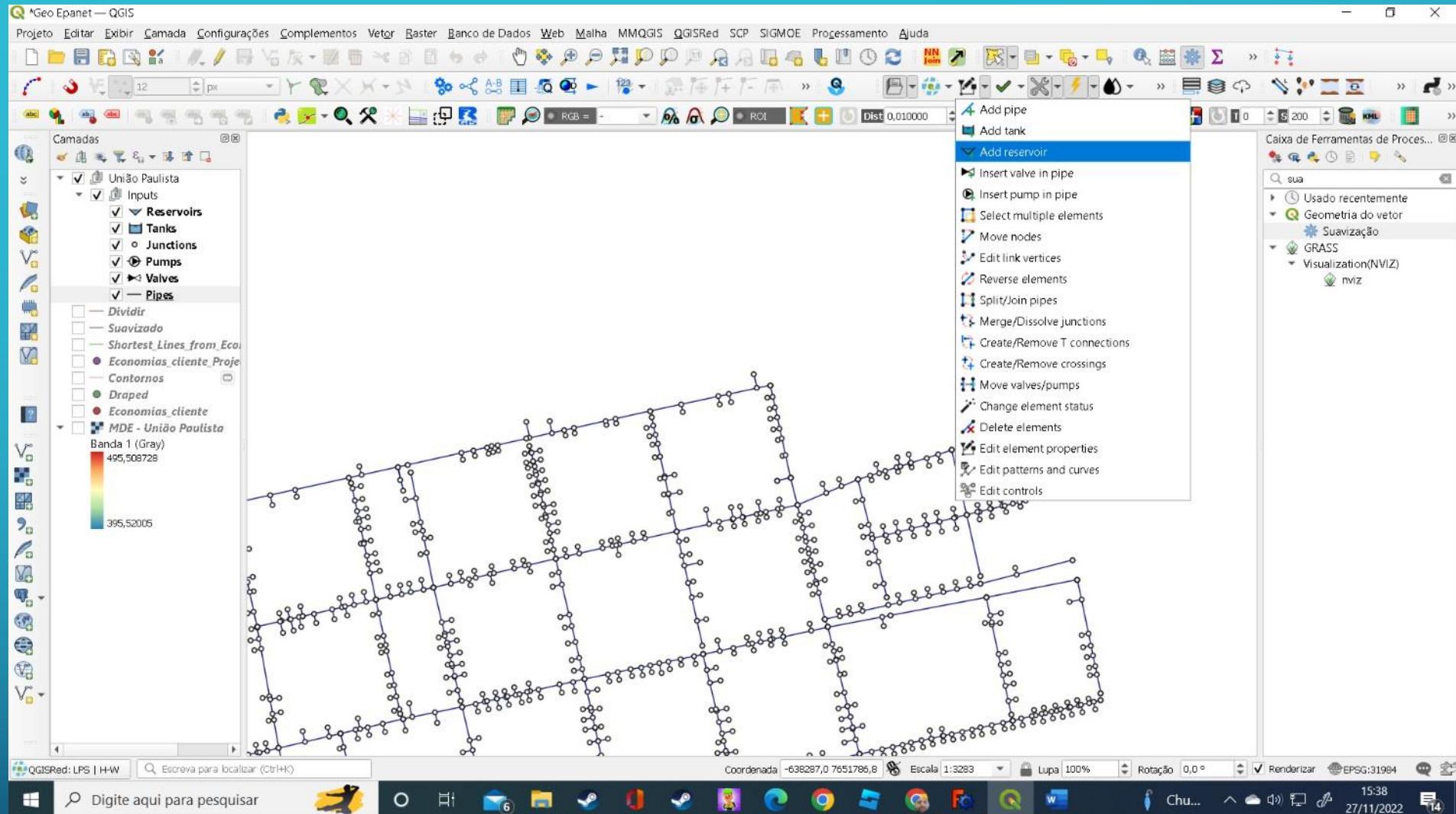


Figura 72 - Adicionar reservatório

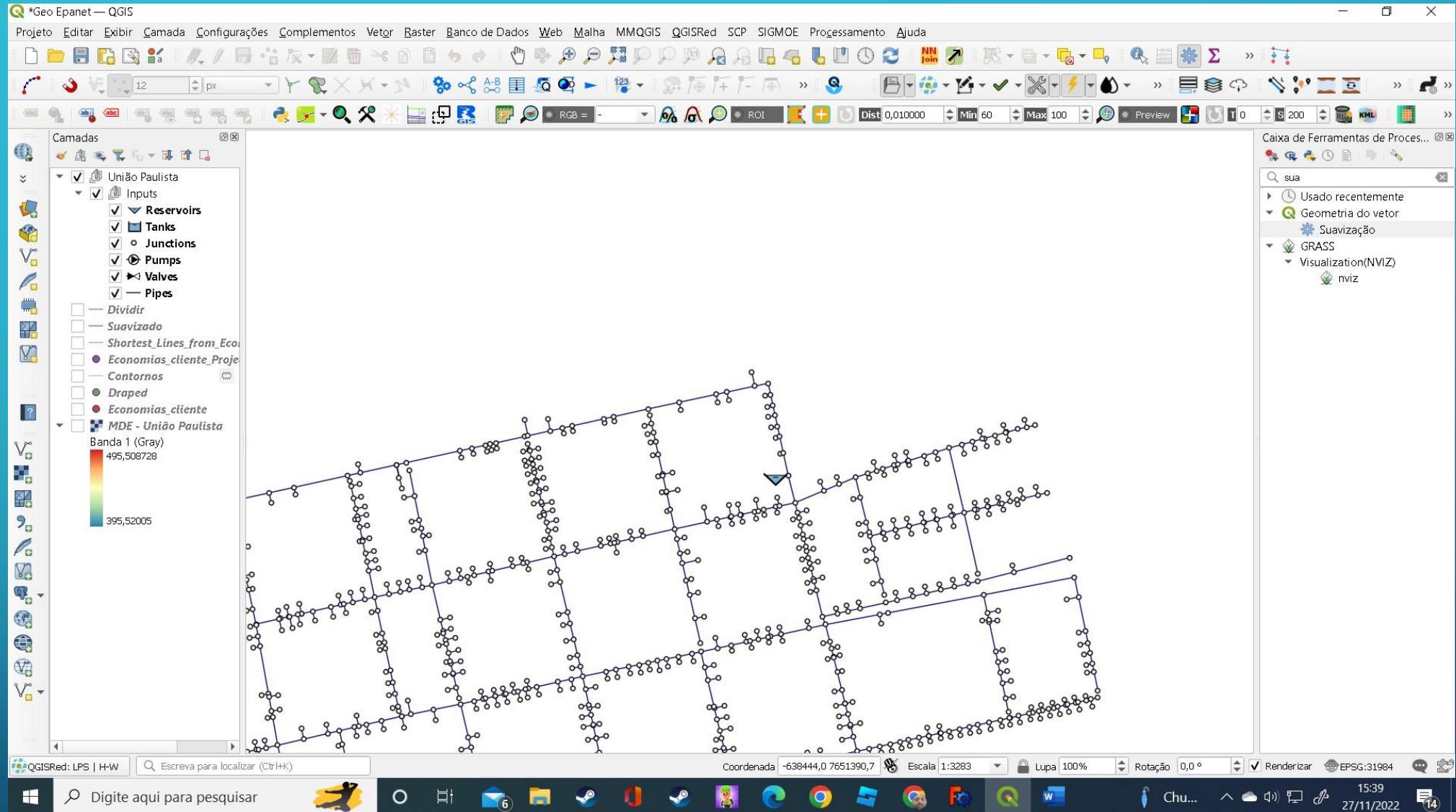


Figura 73- Reservatório adicionado

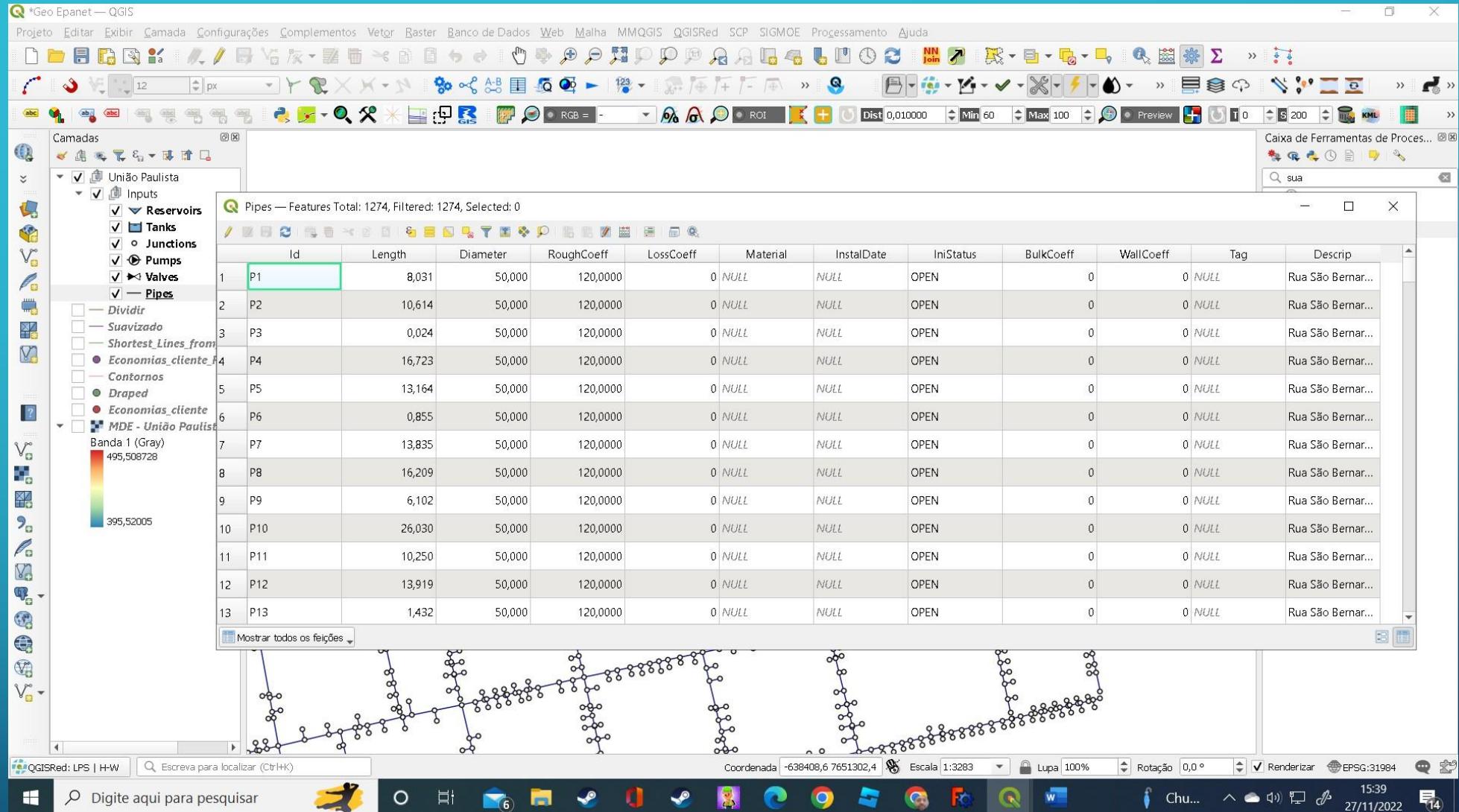


Figura 74 - Exemplo tabela atributos rede

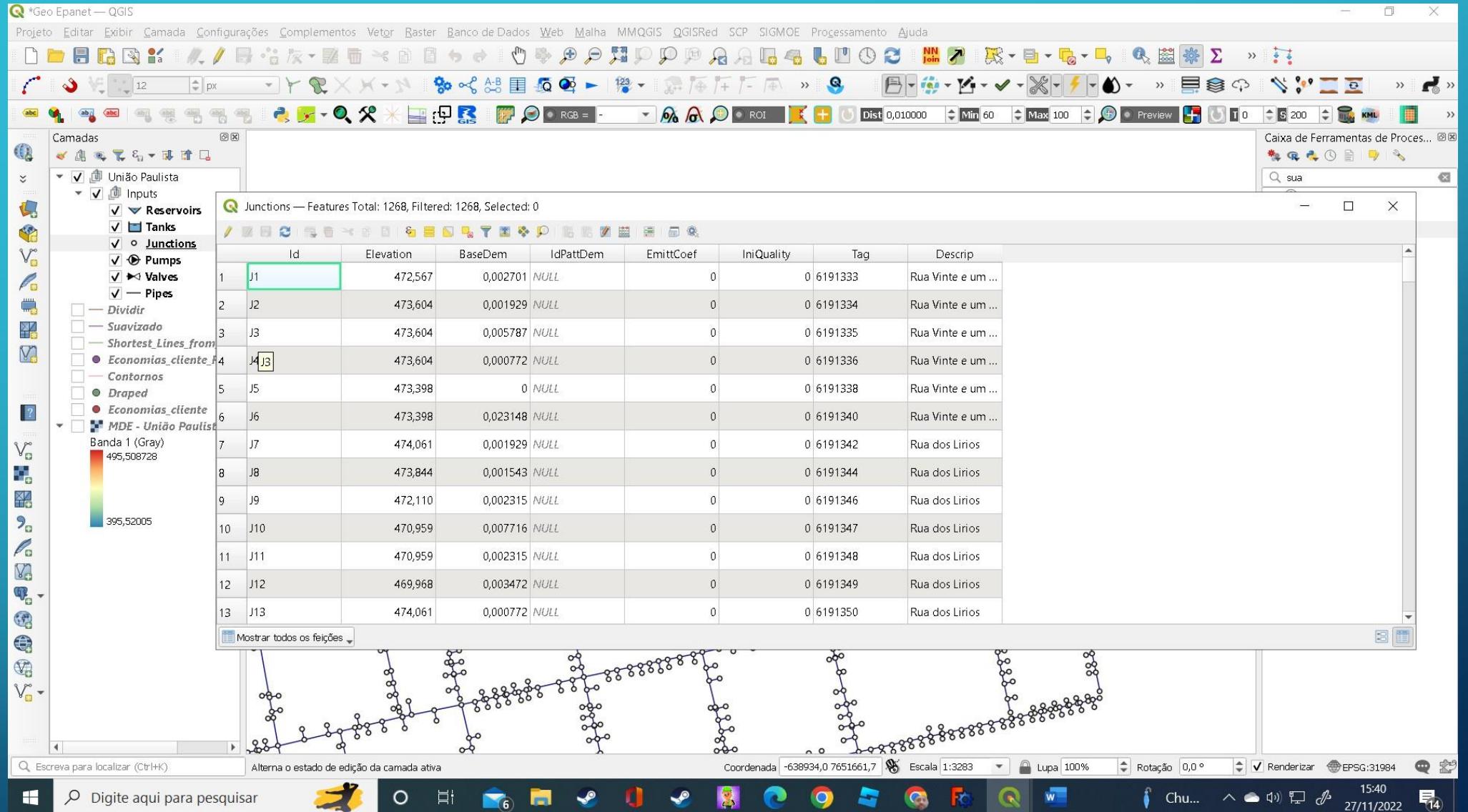


Figura 75 - Exemplo tabela atributos - Junctions