Supporting Information

Human NEIL3 gene expression is regulated by epigenetic-like oxidative DNA modification

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Additional Methods

Plasmid Construction

The plasmids were constructed from the psiCHECK2 plasmid (Promega) that has coding sequences for the Renilla luciferase (Rluc) and firefly luciferase (luc) genes. The luc gene is regulated by the HSV-TK promoter and was not modified allowing expression from this luciferase to be used as the internal standard. The data were collected via a dual-glo luciferase assay (Promega). The Rluc gene was originally regulated by the SV40 early enhancer/promoter, which we modified by removing the TATA-box and replacing it with the NEIL3 potential G-quadruplex sequences (PQS) of interest. Additionally, the NEIL3 PQS was flanked by recognition sequences for the Nt.BspQ1 nicking endonuclease. Insertion of the PQS and nicking endonuclease recognition sequences was achieved using restriction free cloning. The cloning experiment was conducted in a 25-µL reaction with 1x Phusion reaction buffer (NEB), 200 µM dNTPs, 1 µM each of the forward and reverse primers, 1,000 ng of psiCHECK2 plasmid, 3% DMSO, and 0.5 units of Phusion DNA polymerase. The PCR was initiated with a 98 °C denaturation step for 30 sec followed by 30 cycles of PCR consisting of a 98 °C denaturation step for 20 sec, a 55 °C annealing step for 30 sec, a 72 °C extension step for 5 min, and a post step consisting of 98 °C for 8 sec followed by 72 °C for 5 min. After the 30 cycles, a final extension step of 72 °C for 5 min was conducted. Following PCR, the samples were digested with Dpn1 by adding 2.3 µL of Dpn1 reaction buffer and 5 units of Dpn1 to the PCR reaction vessel. The Dpn1 reaction was conducted for 2 hr at 37 °C followed by heat quenching at 80 °C for 20 min.

Following the PCR and Dpn1 reactions, the sample was then transformed in to NEB 5-alpha competent E. coli cells following the manufacturer’s protocol. After transformation, 50-100 µL from the transformation was spread on a pre-warmed agar plate containing ampicillin (100 µg/mL). The plates were incubated overnight at 37 °C. Next, individual colonies were picked and each grown overnight at 37 °C in 5 mL of lysogeny broth media containing ampicillin (100 µg/mL). The plasmid DNA from each grown sample was then purified using a miniprep kit (Qiagen) following the manufacturer’s protocols. Last, ~200 ng of plasmid and 1 µM sequencing forward primer in 15 µL of 10 mM Tris (pH 8.0) was submitted for Sanger sequencing at the DNA Sequencing Core facility at the University of Utah.

Insertion of site-specific modifications into the plasmids was achieved following literature protocols.1,2 Specifically, 5 µg of plasmid with Nt.BspQ1 recognition sequences flanking the site in which the DNA base modification will be inserted was placed in 50 µL of 1x Nt.BspQ1 reaction buffer with 5 U of Nt.BspQ1. The reaction was placed at 50 °C for 60 min followed by heat quenching at 80 °C for 20 min. Next, 1 nmole (~1000x) of 5’-phosphorylated synthetic oligomer with the site-specific modification was added to the quenched reaction. The modified oligomers were synthesized by solid-phase synthesis in the DNA/Peptide Core Facility at the University of Utah. The oligos were cleaved, deprotected, and HPLC purified following protocols previously outlined.3 The plasmid oligomer mixture was thermal cycled by heating at 80 °C for 2 min followed by cooling on ice for 2 min, which was repeated four times. The nicks were then sealed using T4 DNA ligase, by adding 6 µL of 10x ligase buffer and 800 units of ligase. The ligation reaction was left at 20 °C for 4 h. The modified plasmids were purified from the protein and excess insertion oligomer using an Ultra Clean PCR cleanup kit (Mo Bio) following the manufacturer’s protocol. Plasmid concentrations were determined by nanodrop UV-vis measurements.
To confirm the DNA modifications were introduced into the plasmid, we applied a protocol established in our laboratory, in which the modification was removed by a DNA glycosylase to yield a ligatable gap for sequence that we reported on. By ligating the gap, Sanger sequencing provided a characteristic nucleotide loss at the modification site to confirm the presence of the modification.

Primer Sequences

**NEIL3 PQS Insertion Primer 1**
5’- CAG TTC CGC CCA TTC TCC GCC CCA TGG CTG ACG CTC TTC TAG GGT GCT GTT TGG GCG GGG CCT GGG CGG GGC CGC TCT TCT GCA GAG GCC GAG GCC GCC TCG GCC TCT GAG CT

**NEIL3 PQS Insertion Primer 2**
5’- AGC TCA GAG GCC GAG GCG GCC TCG GCC TCT GCA GAA GAG CGG CCC CGC CCA GGC CCC GCC CAA ACA GCA CCC TAG AAG AGC GTC AGC CAT GGG GCG GAG AAT GGG CGG AAC TG

**Sequencing Primer**
5’- TTT TTT TTT TTT TTT TTT TTT TTT TTT TTT TTT TTT TTT TTT TTT TTT TTT TTT TTC ATG CAT CTC AAT TAG TCA GCA ACC ATA GT
Figure S1. Determination of oxidation prone sites in the NEIL3 PQS by PAGE

**NEIL3 G4 Oxidation via the Type I Photooxidant Riboflavin**

The Maxam-Gilbert G-lanes were conducted in 20 µL of ddH₂O by allowing 500 pmoles of NEIL3 G4 react with 1% DMS for 30 sec followed by quenching with 1 M β-mercaptoethanol. The reaction was dialyzed against ddH₂O overnight and then treated with the piperidine and sequencing protocol outlined for the oxidation reactions in the text.

**Reaction Conditions:** 10 µM Quad at 37 °C
20 mM KP₄ (pH 7.4) + 12 mM NaCl + 120 mM KCl + 50 µM Riboflavin + 350 nm light

These two plots are not to scale with one another.

Background cleavage was subtracted to determine % cleavage. Triplicate trials established the error to be ± 0.5%
See previous gel caption for the Maxam-Gilbert G-lane reaction conditions.
**Figure S2.** The presence of NAC does not impact oxidation sites in the *NEIL3 PQS*

Plots to compare riboflavin reactions with and without NAC present

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**Reaction without NAC**

```
5' - ATATTGGGCGGGGCCTGGGGGGGGAATAT - 3'
3' - TATAACCCGCCCCGGACCCGCCCTTATA - 5'
```

**Reaction with NAC**

```
5' - ATATTGGGCGGGGCCTGGGGGGGGAATAT - 3'
3' - TATAACCCGCCCCGGACCCGCCCTTATA - 5'
```

Background cleavage was subtracted to determine % cleavage.
Triplicate trials established the error to be ± 0.5%
Figure S3. Outline of method to quantify G oxidation products from the NEIL3 PQS

Method for Determination of G-Oxidation Products

The method to quantify G oxidation products from the NEIL3 PQS was established on the human telomere G4 sequence and previously reported.5,6

Table of Average Relative Amounts of Each G Oxidation Product Detected

| Average Relative Amounts (%) | NEIL3 G4 | NEIL3 Duplex | NEIL3 G4 | NEIL3 Duplex |
|------------------------------|----------|--------------|----------|--------------|
| Riboflavin                   |          |              |          |              |
| NAC-                         | 1.4      | 8.8          | NAC-     | 2.1          |
| NAC+                         | 43.2     | 67.7         | NAC+     | 21.6         |
| OG                           | 2.4      | 5.5          |          | 44.3         |
| Z                            | 53.0     | 18.0         |          | 2.1          |

*The average error for each measurement on the basis of triplicate measurements is ~10% of the value.
Figure S4. The CD and $T_m$ analysis to verify folding under APE1 reaction conditions

$T_m$ values measured at high and low ionic strength

High ionic strength

= 20 mM KPi, pH 7.4, 120 mM KCl, 12 mM NaCl

Low ionic strength (i.e., APE1 buffer)

= 20 mM Tris pH 7.9 and 50 mM KOAc
The CD spectra for the wild-type sequences suggest parallel-stranded G4s in the APE1 buffer and the spectra are nearly identical to those reported for the same sequence in high ionic strength buffer as previously reported.\textsuperscript{7,8} The presence of an F at any position and strand length supports a mixture of folds that is similar to our previous report for the same sequence with the modification OG.\textsuperscript{7}
Figure S5. Sequencing PAGE analysis to monitor the APE1 reaction on the *NEIL3* PQS

The example gel provided is for the four-track *NEIL3* PQS with an F at a core position (i.e., G23) in the dsDNA or G4 contexts.
Table of the averages and standard deviations from the PAGE analysis of the APE1 cleavage reactions.

**NEIL3 Four-track core F**

| time point | Avg. % Yield dsDNA | Std. Dev. dsDNA | Avg. % Yield G4 | Std. Dev. G4 |
|------------|--------------------|-----------------|-----------------|--------------|
| 0          | 0.0                | 0.0             | 0.0             | 0.0          |
| 1          | 56.4               | 0.8             | 4.4             | 1.1          |
| 5          | 67.8               | 1.6             | 5.0             | 2.2          |
| 10         | 68.6               | 0.4             | 8.5             | 2.7          |
| 30         | 71.3               | 0.0             | 19.3            | 2.6          |
| 60         | 78.5               | 0.4             | 25.8            | 2.4          |

**NEIL3 Four-track loop F**

| time point | Avg. % Yield dsDNA | Std. Dev. dsDNA | Avg. % Yield G4 | Std. Dev. G4 |
|------------|--------------------|-----------------|-----------------|--------------|
| 0          | 0.0                | 0.0             | 0.0             | 0.0          |
| 1          | 5.2                | 0.6             | 1.5             | 0.2          |
| 5          | 40.3               | 1.9             | 0.8             | 0.4          |
| 10         | 65.1               | 1.0             | 1.1             | 0.1          |
| 30         | 70.7               | 1.5             | 2.1             | 1.1          |
| 60         | 80.2               | 0.6             | 2.6             | 0.6          |

**NEIL3 Five-track core F**

| time point | Avg. % Yield dsDNA | Std. Dev. dsDNA | Avg. % Yield G4 | Std. Dev. G4 |
|------------|--------------------|-----------------|-----------------|--------------|
| 0          | 0.0                | 0.0             | 0.0             | 0.0          |
| 1          | 13.7               | 5.5             | 0.1             | 0.0          |
| 5          | 35.3               | 6.7             | 0.2             | 0.2          |
| 10         | 44.7               | 5.4             | 0.4             | 0.4          |
| 30         | 50.4               | 0.7             | 0.8             | 0.7          |
| 60         | 65.9               | 5.2             | 3.9             | 0.7          |

**NEIL3 Five-track loop F**

| time point | Avg. % Yield dsDNA | Std. Dev. dsDNA | Avg. % Yield G4 | Std. Dev. G4 |
|------------|--------------------|-----------------|-----------------|--------------|
| 0          | 0.0                | 0.0             | 0.0             | 0.0          |
| 1          | 20.9               | 5.6             | 0.5             | 0.6          |
| 5          | 59.6               | 7.9             | 1.3             | 0.2          |
| 10         | 71.8               | 6.4             | 0.6             | 0.4          |
| 30         | 80.9               | 0.7             | 1.6             | 0.4          |
| 60         | 82.1               | 0.5             | 3.6             | 1.2          |
Figure S6. NEIL expression levels in cancer cells and genes with OGG1 ChIP-Seq peaks containing a PQS.
| Chromosome | Loci   | Start   | Loci       | Gene     |
|------------|--------|---------|------------|----------|
| chr13      | 20957200 | 20957418 | ENST00000453800 | PPIAP27  |
| chr13      | 25474753 | 25474969 | ENST00000255283 | ATP8A2   |
| chr13      | 43957622 | 43957672 | ENST00000629019 | LINC00284|
| chr13      | 52718553 | 52718661 | ENST00000448904 | LECT1    |
| chr13      | 97964672 | 97965240 | ENST00000357602 | IPO5     |
| chr13      | 98391183 | 98391233 | ENST00000600190 | FARP1    |
| chr13      | 100551103| 100551239| ENST00000376250 | GGACT    |
| chr13      | 102165127| 102165752| ENST00000376131 | FGF14    |
| chr13      | 102753262| 102753396| ENST00000322527 | CCDC168  |
| chr13      | 107311950| 107312239| ENST00000375915 | FAM155A  |
| chr13      | 108592661| 108592796| ENST00000356711 | MYO16    |
| chr13      | 112784585| 112784635| ENST00000459908 | ATP11A   |
| chr13      | 112784585| 112784635| ENST00000459908 | ATP11A   |
| chr12      | 2446207  | 2446557  | ENST00000615400 | CACNA1C  |
| chr12      | 4621987  | 4622717  | ENST00000545990 | AKAP3    |
| chr12      | 5636607  | 5636752  | ENST00000546188 | ANO2     |
| chr12      | 5636607  | 5636752  | ENST00000546188 | ANO2     |
| chr12      | 6516037  | 6516282  | ENST00000545732 | NCPAD2   |
| chr12      | 9605264  | 9605326  | ENST00000229402 | KLRB1    |
| chr12      | 9841161  | 9841360  | ENST00000537723 | KLRF1    |
| chr12      | 13593463 | 13594187 | ENST00000628166 | GRIN2B   |
| chr12      | 15345521 | 15345683 | ENST00000545023 | PTPRO    |
| chr12      | 15742297 | 15742424 | ENST00000535752 | EPS8     |
| chr12      | 17120969 | 17121158 | ENST00000481703 | RPL7P40  |
| chr12      | 21014815 | 21014951 | ENST00000421593 | SLC01B7  |
| chr12      | 21812559 | 21812728 | ENST00000261200 | ABCC9    |
| chr12      | 22384224 | 22384594 | ENST00000536558 | ST8S1A1  |
| chr12      | 22677263 | 22677375 | ENST00000544191 | ETNK1    |
| chr12      | 24438084 | 24438336 | ENST00000429944 | RP11-444D3.1 |
| chr12      | 25182926 | 25183101 | ENST00000354189 | CASC1    |
| chr12      | 27446252 | 27446357 | ENST00000500498 | ARNTL2-AS1 |
| chr12      | 27545225 | 27545357 | ENST00000535575 | PPFIBP1  |
| chr12      | 42140162 | 42140215 | ENST00000398675 | GXYLT1   |
| Chr | Start | End   | Transcript ID     | Gene Name          |
|-----|-------|-------|-------------------|-------------------|
| chr12 | 42225597 | 42225647 | ENST00000327791 | YAF2              |
| chr12 | 44250357 | 44250864 | ENST00000550623 | TMEM117           |
| chr12 | 46836848 | 46836906 | ENST00000546940 | SLC38A4           |
| chr12 | 49915657 | 49915745 | ENST00000549734 | RP11-70F11.8      |
| chr12 | 51638593 | 51638660 | ENST00000545061 | SCN8A             |
| chr12 | 53035926 | 53036479 | ENST0000052905  | RP11-983P16.4     |
| chr12 | 55006283 | 55006369 | ENST00000547559 | RP11-616L12.1     |
| chr12 | 55298382 | 55298879 | ENST00000358433 | OR6C6             |
| chr12 | 55705233 | 55705480 | ENST00000553804 | ITGA7             |
| chr12 | 58903558 | 58904077 | ENST00000552267 | LRIG3             |
| chr12 | 62220946 | 62221226 | ENST00000549456 | FAM19A2           |
| chr12 | 62220946 | 62221226 | ENST00000549456 | FAM19A2           |
| chr12 | 63005210 | 63005261 | ENST00000550738 | LDHAL6CP          |
| chr12 | 65040162 | 65040349 | ENST00000360528 | RP11-168J19.2     |
| chr12 | 65133849 | 65134335 | ENST00000536787 | APOOP3            |
| chr12 | 67979303 | 67979495 | ENST00000355509 | GS1-410F4.5       |
| chr12 | 68289169 | 68289430 | ENST00000357874 | MDM1              |
| chr12 | 69798157 | 69798340 | ENST00000550847 | RAB3IP            |
| chr12 | 70061332 | 70062058 | ENST00000549419 | LINC01481         |
| chr12 | 77771625 | 77771846 | ENST00000549993 | RP11-781A6.1      |
| chr12 | 81068459 | 81068542 | ENST00000549175 | ACSS3             |
| chr12 | 83148742 | 83148856 | ENST00000464696 | RPL6P25           |
| chr12 | 86815733 | 86815893 | ENST00000621808 | MGAT4C            |
| chr12 | 95654742 | 95655041 | ENST00000552554 | PGAM1P5           |
| chr12 | 95654742 | 95655041 | ENST00000552554 | PGAM1P5           |
| chr12 | 95654742 | 95655041 | ENST00000552554 | PGAM1P5           |
| chr12 | 95654742 | 95655041 | ENST00000552554 | PGAM1P5           |
| chr12 | 95654742 | 95655041 | ENST00000552554 | PGAM1P5           |
| chr12 | 95654742 | 95655041 | ENST00000552554 | PGAM1P5           |
| chr12 | 95654742 | 95655041 | ENST00000552554 | PGAM1P5           |
| chr12 | 95654742 | 95655041 | ENST00000552554 | PGAM1P5           |
| chr12 | 95655302 | 95655468 | ENST00000552554 | PGAM1P5           |
| chr12 | 95655302 | 95655468 | ENST00000552554 | PGAM1P5           |
| chr12 | 95655302 | 95655468 | ENST00000552554 | PGAM1P5           |
| chr12 | 95655302 | 95655468 | ENST00000552554 | PGAM1P5           |
| chr12 | 95733693 | 95733775 | ENST00000343702 | NTN4              |
| chr12 | 95837178 | 95837498 | ENST00000553194 | RP11-536G4.2      |
| chr12 | 95837178 | 95837498 | ENST00000553194 | RP11-536G4.2      |
| chr12 | 95879983 | 95880158 | ENST00000344280 | CCDC38            |
| chr12 | 97440867 | 97440988 | ENST00000538559 | RMST              |
| chr12 | 98988506 | 98988919 | ENST00000549558 | ANKS1B            |
| chr12 | 98988506 | 98988919 | ENST00000549558 | ANKS1B            |
| chr12 | 102131529| 102131953| ENST00000417507 | PARPBP            |
| Chr  | Start    | Stop     | Gene      | Description       |
|------|----------|----------|-----------|-------------------|
| chr12| 103287469| 103287703| ENST00000550650 | C12orf42         |
| chr12| 104006152| 104006317| ENST000005360814 | GLT8D2          |
| chr12| 105371991| 105372092| ENST00000548336 | C12orf75         |
| chr12| 108287233| 108287489| ENST00000412676 | CMKL1R           |
| chr12| 108287233| 108287489| ENST00000412676 | CMKL1R           |
| chr12| 109809429| 109809586| ENST00000418703 | TRPV4            |
| chr12| 110947089| 110947258| ENST00000547607 | LINC01405        |
| chr12| 111113672| 11113735 | ENST00000397643 | CUX2             |
| chr12| 113876559| 113876712| ENST00000545145 | RBM19            |
| chr12| 115876176| 115876331| ENST00000546414 | RP11-110L15.2    |
| chr12| 117222409| 117222501| ENST00000317775 | NOS1             |
| chr12| 117635841| 117635996| ENST00000425217 | KSR2             |
| chr12| 117681970| 117682415| ENST00000425217 | KSR2             |
| chr12| 118169914| 118170092| ENST00000419821 | TAO3             |
| chr12| 119073610| 119073727| ENST00000537730 | RP11-364C11.2    |
| chr12| 119243523| 119243611| ENST00000536009 | RP11-64B16.5     |
| chr12| 119397804| 119397873| ENST00000535685 | CCDC6            |
| chr12| 119489905| 119489955| ENST00000537366 | RP11-768F21.1    |
| chr12| 121145611| 121145689| ENST00000535250 | P2RX7            |
| chr12| 121458400| 121459252| ENST00000377069 | KDM2B            |
| chr12| 121506733| 121507010| ENST00000377069 | KDM2B            |
| chr12| 121747199| 121747297| ENST00000541467 | TMEM120B         |
| chr12| 121747549| 121747607| ENST00000541467 | TMEM120B         |
| chr12| 121748101| 121748182| ENST00000541467 | TMEM120B         |
| chr12| 121787821| 121787929| ENST00000267205 | RHOF             |
| chr12| 123654445| 123654655| ENST00000623811 | RP11-338K17.6    |
| chr12| 123807858| 123808103| ENST00000447853 | DNAH10           |
| chr12| 123807858| 123808103| ENST00000447853 | DNAH10           |
| chr12| 124476960| 124477194| ENST00000542927 | NCOR2            |
| chr12| 124476960| 124477194| ENST00000542927 | NCOR2            |
| chr12| 125089766| 125089983| ENST00000418937 | AACS             |
| chr12| 125529002| 125529196| ENST00000534945 | TMEM132B         |
| chr12| 125529002| 125529196| ENST00000534945 | TMEM132B         |
| chr12| 125529002| 125529196| ENST00000534945 | TMEM132B         |
| chr12| 126459367| 126459658| ENST00000536421 | RP5-944M2.4      |
| chr12| 130439268| 130439845| ENST00000535703 | RIMBP2           |
| chr12| 130439268| 130439845| ENST00000535703 | RIMBP2           |
| chr12| 130439268| 130439845| ENST00000535703 | RIMBP2           |
| chr12| 130439268| 130439845| ENST00000535703 | RIMBP2           |
| chr12| 131016957| 131017174| ENST00000376682 | ADGRD1           |
| chr12| 131918777| 131918827| ENST00000540647 | ULK1             |
| chr12| 132267772| 132268271| ENST00000424720 | GALNT9           |
| Chromosome | Start | End   | Gene Symbol(s) | Description |
|------------|-------|-------|----------------|-------------|
| chr12      | 132267772 | 132268271 | ENST00000424720 | GALNT9     |
| chr12      | 132267772 | 132268271 | ENST00000424720 | GALNT9     |
| chr12      | 132267772 | 132268271 | ENST00000424720 | GALNT9     |
| chr12      | 132267772 | 132268271 | ENST00000424720 | GALNT9     |
| chr11      | 1170703   | 1170942 | ENST00000621226 | MUC5AC     |
| chr11      | 1170703   | 1170942 | ENST00000621226 | MUC5AC     |
| chr11      | 1175637   | 1175689 | ENST00000621226 | MUC5AC     |
| chr11      | 1861666   | 1862101 | ENST00000421485 | LSP1       |
| chr11      | 1893131   | 1893370 | ENST00000391480 | PRR33      |
| chr11      | 7066049   | 7066189 | ENST00000299481 | NLRP14     |
| chr11      | 7234021   | 7234160 | ENST00000408776 | MIR302E    |
| chr11      | 8425013   | 8425352 | ENST00000473980 | STK33      |
| chr11      | 8853907   | 8854308 | ENST00000526155 | ST5        |
| chr11      | 14307068  | 14307219 | ENST00000529237 | RRAS2      |
| chr11      | 16375879  | 16376105 | ENST00000528252 | SOX6       |
| chr11      | 22113044  | 22113266 | ENST00000530837 | CTD-2019O4.1 |
| chr11      | 29724650  | 29724748 | ENST00000498657 | RPL7AP58   |
| chr11      | 31063410  | 31063578 | ENST00000597505 | DCDC1      |
| chr11      | 32631607  | 32631691 | ENST00000335185 | CCDC73     |
| chr11      | 33788423  | 33788527 | ENST00000529152 | RP11-646J21.7 |
| chr11      | 40729995  | 40730188 | ENST00000534577 | LRRC4C     |
| chr11      | 50337178  | 50337238 | ENST00000533230 | RP11-574M7.1 |
| chr11      | 59312448  | 59312781 | ENST00000534535 | OR5AN2P    |
| chr11      | 59724095  | 59724341 | ENST00000300150 | STX3       |
| chr11      | 59769852  | 59769919 | ENST00000530498 | STX3       |
| chr11      | 61391234  | 61391292 | ENST00000515837 | TMEM216    |
| chr11      | 63214920  | 63215512 | ENST00000525620 | SLC22A10   |
| chr11      | 63221312  | 63221508 | ENST00000525620 | SLC22A10   |
| chr11      | 68817792  | 68817853 | ENST00000376618 | CPT1A      |
| chr11      | 69813564  | 69813888 | ENST00000334134 | FGF3       |
| chr11      | 70122462  | 70122666 | ENST00000531349 | ANO1       |
| chr11      | 70125236  | 70125356 | ENST00000531349 | ANO1       |
| chr11      | 70787037  | 70787519 | ENST00000470759 | SHANK2     |
| chr11      | 72708911  | 72708961 | ENST00000464109 | RPS12P20   |
| chr11      | 78183572  | 78183644 | ENST00000529350 | KCTD21     |
| chr11      | 84726628  | 84727341 | ENST00000398309 | DLG2       |
| chr11      | 86995799  | 86995982 | ENST00000531827 | RP11-736K20.6 |
| chr11      | 87044945  | 87045100 | ENST00000305494 | TMEM135    |
| chr11      | 99115614  | 99115809 | ENST00000528682 | CNTN5      |
| chr11      | 100234570 | 100234719 | ENST00000524560 | CNTN5      |
| chr11      | 103072553 | 103072793 | ENST00000527280 | DCUN1D5    |
| chr11      | 103675603 | 103675833 | ENST00000533459 | RP11-563P16.1 |
| chr11      | 103975117 | 103975330 | ENST00000393158 | PDGFD      |
| Chromosome | Start Position | End Position | Gene ID | Description |
|------------|----------------|--------------|---------|-------------|
| chr11      | 110881727      | 110882089    | ENST00000530590 | RP11-97I14.1 |
| chr11      | 122448419      | 122448577    | ENST00000516967 | RNU4ATA1C10P |
| chr11      | 122729835      | 122730174    | ENST00000458998 | snoU13       |
| chr11      | 128994285      | 128994389    | ENST00000310343 | ARHGAP32     |
| chr11      | 129207238      | 129207541    | ENST00000525234 | ARHGAP32     |
| chr11      | 131508288      | 131509012    | ENST00000550167 | NTM          |
| chr11      | 132476507      | 132476828    | ENST00000331898 | OPCML        |
| chr10      | 296623         | 296930       | ENST00000381496 | DIP2C        |
| chr10      | 417900         | 417963       | ENST00000381496 | DIP2C        |
| chr10      | 417900         | 417963       | ENST00000381496 | DIP2C        |
| chr10      | 3110987        | 3111265      | ENST00000413079 | PFKP         |
| chr10      | 4794165        | 4794457      | ENST00000462718 | AKR1E2       |
| chr10      | 5598181        | 5598655      | ENST00000478294 | RP13-463N16.6|
| chr10      | 5772507        | 5772664      | ENST00000380191 | GDI2         |
| chr10      | 6248781        | 6249155      | ENST00000459607 | Y_RNA        |
| chr10      | 7300087        | 7300284      | ENST00000361972 | SFMBT2       |
| chr10      | 7378088        | 7378658      | ENST00000361972 | SFMBT2       |
| chr10      | 7378088        | 7378658      | ENST00000361972 | SFMBT2       |
| chr10      | 7378088        | 7378658      | ENST00000361972 | SFMBT2       |
| chr10      | 7378088        | 7378658      | ENST00000361972 | SFMBT2       |
| chr10      | 7378088        | 7378658      | ENST00000361972 | SFMBT2       |
| chr10      | 7378088        | 7378658      | ENST00000361972 | SFMBT2       |
| chr10      | 19278434       | 19278484     | ENST00000377266 | MALRD1       |
| chr10      | 19963411       | 19963797     | ENST00000377242 | PLXDC2       |
| chr10      | 20827893       | 20827964     | ENST00000460652 | NEBL         |
| chr10      | 21665244       | 21665448     | ENST00000364520 | RN66-1141P   |
| chr10      | 21961411       | 21961611     | ENST00000476103 | DNAJC1       |
| chr10      | 23328190       | 23328290     | ENST00000376500 | C10orf67     |
| chr10      | 26818448       | 26818725     | ENST00000376170 | ABI1         |
| chr10      | 30951672       | 30951898     | ENST00000331737 | ZNF438       |
| chr10      | 33062487       | 33062882     | ENST00000468834 | RP11-462L8.2 |
| chr10      | 35693074       | 35693124     | ENST00000425095 | RPL7P37      |
| chr10      | 43728095       | 43728253     | ENST00000603304 | RP11-272J7.6 |
| chr10      | 44954788       | 44954838     | ENST00000425541 | RP11-285G1.9 |
| chr10      | 45037391       | 45037776     | ENST00000456938 | CEP164P      |
| chr10      | 45838169       | 45838405     | ENST00000448048 | AGAP4        |
| chr10      | 45858716       | 45859077     | ENST00000440803 | PARGP1       |
| chr10      | 46119480       | 46120658     | ENST00000582299 | AGAP7P       |
| chr10      | 47954039       | 47954539     | ENST00000613389 | CH17-360D5.2 |
| chr10      | 48221769       | 48221865     | ENST00000486151 | FRMPD2       |
| chr10      | 48221769       | 48222165     | ENST00000486151 | FRMPD2       |
| chr10  |    |    |                        |                          |
|--------|----|----|------------------------|--------------------------|
|        |    |    | chr10 49685102 49685278 | ENST00000374112 C10orf53 |
|        |    |    | chr10 50241871 50242029 | ENST00000395526 ASAH2     |
|        |    |    | chr10 50487061 50487261  | ENST00000619438 SGMS1     |
|        |    |    | chr10 51114295 51114532  | ENST00000373980 PRKG1     |
|        |    |    | chr10 51997252 51997371  | ENST00000401604 PRKG1     |
|        |    |    | chr10 52275268 52275627  | ENST00000373975 PRKG1     |
|        |    |    | chr10 52719221 52719833  | ENST00000443523 RP11-556E13.1 |
|        |    |    | chr10 60642437 60642772  | ENST00000510382 ANK3      |
|        |    |    | chr10 62372650 62372708  | ENST00000410046 ZNF365    |
|        |    |    | chr10 62798686 62798826  | ENST00000425290 RP11-436D10.3 |
|        |    |    | chr10 67198865 67199057  | ENST00000545309 CTNA3     |
|        |    |    | chr10 69418764 69419046  | ENST00000373306 TACR2     |
|        |    |    | chr10 71688355 71689127  | ENST00000442677 CDH23     |
|        |    |    | chr10 71688355 71689127  | ENST00000442677 CDH23     |
|        |    |    | chr10 71688355 71689127  | ENST00000442677 CDH23     |
|        |    |    | chr10 71688355 71689127  | ENST00000442677 CDH23     |
|        |    |    | chr10 71688355 71689127  | ENST00000442677 CDH23     |
|        |    |    | chr10 71688355 71689127  | ENST00000442677 CDH23     |
|        |    |    | chr10 71688355 71689127  | ENST00000442677 CDH23     |
|        |    |    | chr10 75924616 75924702  | ENST00000372499 C10orf11  |
|        |    |    | chr10 77063285 77063413  | ENST00000604624 KCNA1     |
|        |    |    | chr10 79280019 79280230  | ENST00000478357 ZMIZ1     |
|        |    |    | chr10 79758210 79758556  | ENST00000596088 NUTM2B-AS1 |
|        |    |    | chr10 88407025 88407143  | ENST00000371947 RNLS      |
|        |    |    | chr10 89311338 89311454  | ENST00000282673 LIPA      |
|        |    |    | chr10 94778737 94779161  | ENST00000446659 MTND4P19  |
|        |    |    | chr10 95781045 95781303  | ENST00000483213 ENTPD1    |
|        |    |    | chr10 95928949 95929239  | ENST00000423344 C10orf131 |
|        |    |    | chr10 98520742 98520893  | ENST00000404542 HPSE2     |
|        |    |    | chr10 98790381 98790576  | ENST00000370552 HPSE2     |
|        |    |    | chr10 98874993 98875043  | ENST00000370552 HPSE2     |
|        |    |    | chr10 102164406 102164938 | ENST00000477977 NOLC1     |
|        |    |    | chr10 104258670 104258806 | ENST00000432659 GSTO1     |
|        |    |    | chr10 104258670 104258806 | ENST00000432659 GSTO1     |
|        |    |    | chr10 110085880 110085985 | ENST00000486014 ADD3      |
|        |    |    | chr10 110753151 110753201 | ENST00000369519 RBM20     |
|        |    |    | chr10 112904514 112904769 | ENST00000428766 RP11-57H14.3 |
|        |    |    | chr10 114361126 114361218 | ENST00000419268 AFAP1L2   |
|        |    |    | chr10 117563067 117563789 | ENST00000450247 CTA-109P11.1 |
|        |    |    | chr10 119163776 119164048 | ENST00000355697 SFXN4     |
|        |    |    | chr10 119528199 119528407 | ENST00000392865 RGS10     |
| Chromosome | Start Position | End Position | Transcript Id | Gene Name |
|------------|----------------|--------------|---------------|-----------|
| chr10      | 119528199      | 119528407    | ENST00000392865 | RGS10     |
| chr10      | 120847719      | 120847895    | ENST00000628194 | WDR11-AS1 |
| chr10      | 121587136      | 121587602    | ENST00000613324 | FGFR2     |
| chr10      | 125896624      | 125896779    | ENST00000368693 | FANK1     |
| chr10      | 126999794      | 126999863    | ENST00000623213 | DOCK1     |
| chr10      | 132392287      | 132392722    | ENST00000305233 | PWWP2B    |
| chr10      | 132712867      | 132713093    | ENST00000498337 | INPP5A    |
| chr10      | 133066203      | 133066381    | ENST00000607359 | ADGRA1    |
| chr10      | 133338330      | 133338934    | ENST00000368555 | CALY      |
| chr10      | 133469134      | 133469624    | ENST00000475114 | SCART1    |
| chr10      | 133753644      | 133753769    | ENST00000554103 | DUX4L13   |
| chr17      | 270798         | 271062       | ENST00000576001 | RPH3AL    |
| chr17      | 1285663        | 1285785      | ENST00000338313 | TUSC5     |
| chr17      | 1484421        | 1484555      | ENST00000573853 | MYO1C     |
| chr17      | 1739794        | 1740259      | ENST00000453066 | SERPINF2  |
| chr17      | 1741100        | 1741204      | ENST00000453066 | SERPINF2  |
| chr17      | 1781130        | 1781323      | ENST00000305513 | SMYD4     |
| chr17 | 2480954 | 2481182 | ENST00000571669 | METTL16 |
| chr17 | 3019046 | 3019286 | ENST00000575979 | RAP1GAP2 |
| chr17 | 3138339 | 3138614 | ENST00000572821 | CTD-230905.3 |
| chr17 | 3689730 | 3689874 | ENST00000552276 | P2RX5 |
| chr17 | 3689730 | 3689874 | ENST00000552276 | P2RX5 |
| chr17 | 4011081 | 4011420 | ENST00000381638 | ZZEF1 |
| chr17 | 4168458 | 4168511 | ENST00000341657 | ANKFY1 |
| chr17 | 4620008 | 4620829 | ENST00000410497 | RN16-955P |
| chr17 | 4689970 | 4690350 | ENST00000572293 | PELP1 |
| chr17 | 4931750 | 4931939 | ENST00000329125 | GP1BA |
| chr17 | 5125683 | 5125818 | ENST00000574788 | USP6 |
| chr17 | 5590833 | 5591038 | ENST00000576905 | NLRP1 |
| chr17 | 6410038 | 6410117 | ENST00000570584 | AIP1 |
| chr17 | 6822248 | 6822336 | ENST00000573966 | TEKT1 |
| chr17 | 7192446 | 7192614 | ENST00000399506 | DLG4 |
| chr17 | 7192446 | 7192614 | ENST00000399506 | DLG4 |
| chr17 | 7480811 | 7481181 | ENST00000311403 | ZBTB4 |
| chr17 | 7998277 | 7999077 | ENST00000254854 | GUCY2D |
| chr17 | 9647701 | 9647931 | ENST00000572923 | RP11-55L4.1 |
| chr17 | 10750862 | 10751103 | ENST00000478739 | RP11-963H4.2 |
| chr17 | 11851010 | 11851183 | ENST00000578834 | DNAH9 |
| chr17 | 12586580 | 12586630 | ENST00000577679 | LINC00670 |
| chr17 | 12588752 | 12588991 | ENST00000577679 | LINC00670 |
| chr17 | 12755364 | 12755977 | ENST00000443061 | MYOC1D |
| chr17 | 13830844 | 13830894 | ENST00000582752 | COX10-AS1 |
| chr17 | 14146184 | 14147634 | ENST00000580561 | COX10 |
| chr17 | 14421763 | 14421898 | ENST00000436469 | AC022816.2 |
| chr17 | 14723617 | 14723757 | ENST00000455092 | AC013248.2 |
| chr17 | 15439706 | 15439998 | ENST00000619038 | CDRT4 |
| chr17 | 15856034 | 15856248 | ENST00000584636 | AC015922.5 |
| chr17 | 16147849 | 16147970 | ENST00000395848 | NCOR1 |
| chr17 | 17225682 | 17225914 | ENST00000417064 | FLCN |
| chr17 | 17802578 | 17802976 | ENST00000583186 | RAI1 |
| chr17 | 17923801 | 17924327 | ENST00000581396 | TOM1L2 |
| chr17 | 18001896 | 18002199 | ENST00000628531 | Y_RNA |
| chr17 | 18055638 | 18055949 | ENST00000481836 | GID4 |
| chr17 | 18182116 | 18182420 | ENST00000577847 | RP11-258F1.1 |
| chr17 | 19043323 | 19043515 | ENST00000583020 | GRAP |
| chr17 | 19444056 | 19444292 | ENST00000629630 | AC004448.5 |
| chr17 | 19658404 | 19658698 | ENST00000578696 | ALDH3A2 |
| chr17 | 19809187 | 19809493 | ENST00000580130 | ULK2 |
| chr17 | 20533499 | 20533569 | ENST00000584274 | RP11-434D2.9 |
| chr17 | 20868887 | 20868958 | ENST00000583962 | CCDC144NL-AS1 |
| Chromosome | Start | End   | Gene             | Description       |
|------------|-------|-------|------------------|-------------------|
| chr17      | 45125650 | 45125939 | ENST00000590644 | PLCD3             |
| chr17      | 45127818 | 45128103 | ENST00000590644 | PLCD3             |
| chr17      | 45195376 | 45195666 | ENST00000590644 | CTD-2020K17.1     |
| chr17      | 47011430 | 47011720 | ENST00000570478  | LRRC37A17P        |
| chr17      | 47064059 | 47064350 | ENST00000575930  | RP11-156P1.3      |
| chr17      | 47817636 | 47817927 | ENST00000570478  | OSBP7             |
| chr17      | 47817636 | 47817927 | ENST00000570478  | OSBP7             |
| chr17      | 47817636 | 47817927 | ENST00000570478  | OSBP7             |
| chr17      | 48731504 | 48731804 | ENST00000495536  | CTD-2377D24.4     |
| chr17      | 50049899 | 50050190 | ENST00000499842  | RP11-1094H24.4    |
| chr17      | 50049899 | 50050190 | ENST00000499842  | RP11-1094H24.4    |
| chr17      | 50127068 | 50127369 | ENST00000507043  | SAMD14            |
| chr17      | 50157682 | 50157983 | ENST00000523083  | RP11-893F2.13     |
| chr17      | 50276217 | 50276518 | ENST00000511882  | TMEM92            |
| chr17      | 52108794 | 52111795 | ENST00000573294  | CA10              |
| chr17      | 52414915 | 52417916 | ENST00000572848  | RP11-429O1.1      |
| chr17      | 56473261 | 56476262 | ENST00000624834  | RP11-502F1.1      |
| chr17      | 56791779 | 56794780 | ENST00000570754  | C10orf67          |
| chr17      | 56817608 | 56820609 | ENST00000397861  | C10orf67          |
| chr17      | 56817608 | 56820609 | ENST00000397861  | C10orf67          |
| chr17      | 56817608 | 56820609 | ENST00000397861  | C10orf67          |
| chr17      | 57318684 | 57321685 | ENST00000579180  | MSI2              |
| chr17      | 57442342 | 57445343 | ENST00000579505  | MSI2              |
| chr17      | 58152771 | 58155772 | ENST00000268912  | OR4D1             |
| chr17      | 61720228 | 61723229 | ENST00000259008  | BRIP1             |
| chr17      | 61970853 | 61973854 | ENST00000397786  | MED13             |
| chr17      | 63397272 | 63395272 | ENST00000583016  | TANCG2            |
| chr17      | 63505719 | 63508720 | ENST00000423435  | ACE3P             |
| chr17      | 63505719 | 63508720 | ENST00000423435  | ACE3P             |
| chr17      | 64014790 | 64017791 | ENST00000583684  | ICAM2             |
| chr17      | 64859224 | 64862225 | ENST00000339474  | LRRRC37A3         |
| chr17      | 65142125 | 65145126 | ENST00000577186  | RGS9              |
| chr17      | 65214274 | 65217275 | ENST00000577595  | RGS9              |
| chr17      | 65782976 | 65785977 | ENST00000580482  | CEP112            |
| chr17      | 66119232 | 66122233 | ENST00000583358  | CEP112            |
| chr17      | 66232682 | 66235683 | ENST00000577982  | APOH              |
| chr17      | 66844958 | 66848959 | ENST00000533854  | CACNG5            |
| chr17      | 66860057 | 66863058 | ENST00000585484  | LINC01482         |
| chr17      | 69114556 | 69117557 | ENST00000590311  | ABCA6             |
| chr17      | 69432765 | 69435766 | ENST0000059094   | MAP2K6            |
| chr17      | 69986505 | 69989506 | ENST00000362931  | _Y RNA            |
| chr17      | 72045496 | 72048497 | ENST00000540802  | SOX9-AS1          |
| chr17      | 72081063 | 72084064 | ENST00000529667  | SOX9-AS1          |
|Chr  | Start Position | End Position | Ensembl Transcript ID | Gene Name(s) |
|------|----------------|--------------|-----------------------|--------------|
|chr17 | 72458690       | 72458791     | ENST00000580175       | LINC00511    |
|chr17 | 72681001       | 72681204     | ENST00000255559       | SLC39A11     |
|chr17 | 72685895       | 72686024     | ENST00000255559       | SLC39A11     |
|chr17 | 72701894       | 72701974     | ENST00000255559       | SLC39A11     |
|chr17 | 73339367       | 73340014     | ENST00000392650       | SDK2         |
|chr17 | 73735807       | 73735930     | ENST00000583854       | CTD-2532D12.4|
|chr17 | 74071860       | 74072048     | ENST00000581028       | RP11-101O21.1|
|chr17 | 74251163       | 74251626     | ENST00000526858       | TTYH2        |
|chr17 | 74897170       | 74897378     | ENST00000621859       | FADS6        |
|chr17 | 75716733       | 75716927     | ENST00000579662       | ITGB4        |
|chr17 | 76018792       | 76018956     | ENST00000301607       | EVP3         |
|chr17 | 76965344       | 76965773     | ENST00000564292       | RP11-87G24.3 |
|chr17 | 77476960       | 77477010     | ENST00000427180       | 9-Sep        |
|chr17 | 77785632       | 77885856     | ENST00000374983       | FLJ45079     |
|chr17 | 78115809       | 78115902     | ENST00000590602       | TMC6         |
|chr17 | 78228925       | 78229134     | ENST00000421688       | TMEM235      |
|chr17 | 78804291       | 78804553     | ENST00000542802       | USP36        |
|chr17 | 78893054       | 78893527     | ENST00000536189       | TIMP2        |
|chr17 | 79264236       | 79264392     | ENST00000578887       | RBFOX3       |
|chr17 | 79264236       | 79264392     | ENST00000578887       | RBFOX3       |
|chr17 | 79264236       | 79264392     | ENST00000578887       | RBFOX3       |
|chr17 | 79292532       | 79292582     | ENST00000578887       | RBFOX3       |
|chr17 | 80229587       | 80229820     | ENST00000571215       | SLC26A11     |
|chr17 | 80313517       | 80314285     | ENST00000576808       | CTD-2047H16.2|
|chr17 | 80587914       | 80588079     | ENST00000573746       | RPTOR        |
|chr17 | 80710015       | 80710445     | ENST00000572733       | RPTOR        |
|chr17 | 80748555       | 80749131     | ENST00000575542       | RPTOR        |
|chr17 | 80748555       | 80749131     | ENST00000575542       | RPTOR        |
|chr17 | 80990177       | 80990414     | ENST00000572525       | CHMP6        |
|chr17 | 81145935       | 81146050     | ENST00000572798       | AATK         |
|chr17 | 81249378       | 81249524     | ENST00000374759       | SLC38A10     |
|chr17 | 81249378       | 81249524     | ENST00000374759       | SLC38A10     |
|chr17 | 81925853       | 81926068     | ENST00000574686       | MAFG         |
|chr17 | 82382178       | 82382228     | ENST00000566971       | RP13-20L14.1 |
|chr17 | 82586194       | 82586751     | ENST00000575578       | FOXK2        |
|chr17 | 82586194       | 82586751     | ENST00000575578       | FOXK2        |
|chr17 | 82586194       | 82586751     | ENST00000575578       | FOXK2        |
|chr17 | 82586194       | 82586751     | ENST00000575578       | FOXK2        |
|chr17 | 82586194       | 82586751     | ENST00000575578       | FOXK2        |
| Chr | Start | End   | Gene       | Description |
|-----|-------|-------|------------|-------------|
| chr17 | 82586194 | 82586751 | ENST00000575578 | FOXK2 |
| chr17 | 82639790 | 82639920 | ENST00000574694 | FOXK2 |
| chr17 | 82639790 | 82639920 | ENST00000574694 | FOXK2 |
| chr17 | 82680760 | 82680976 | ENST00000571995 | RAB40B |
| chr17 | 82680760 | 82680976 | ENST00000571995 | RAB40B |
| chr17 | 83172452 | 83172502 | ENST00000572343 | AC139099.4 |
| chr17 | 30471 | 30541 | ENST00000568710 | Z84812.4 |
| chr16 | 582063 | 582234 | ENST00000476438 | PIGQ |
| chr16 | 978173 | 978301 | ENST00000562570 | RP11-161M6.2 |
| chr16 | 2202571 | 2202707 | ENST00000562043 | MLST8 |
| chr16 | 2314960 | 2315010 | ENST00000301732 | ABCA3 |
| chr16 | 3995225 | 3995379 | ENST00000575550 | ADCY9 |
| chr16 | 6772517 | 6773929 | ENST00000547338 | RBFOX1 |
| chr16 | 6772517 | 6773929 | ENST00000547338 | RBFOX1 |
| chr16 | 7470473 | 7470666 | ENST00000569889 | RBFOX1 |
| chr16 | 9396723 | 9396939 | ENST00000564305 | RP11-243A14.1 |
| chr16 | 10917572 | 10917654 | ENST00000572665 | CIITA |
| chr16 | 11282065 | 11282051 | ENST00000312511 | PRM1 |
| chr16 | 13764506 | 13764682 | ENST00000573369 | U95743.1 |
| chr16 | 18059292 | 18059397 | ENST00000567304 | CTA-481E9.4 |
| chr16 | 19110121 | 19110306 | ENST00000617407 | RP11-626G11.6 |
| chr16 | 19230015 | 19230144 | ENST00000568433 | SYT17 |
| chr16 | 20047033 | 20047092 | ENST00000570682 | GPR139 |
| chr16 | 21912958 | 21913222 | ENST00000517529 | SMG1P4 |
| chr16 | 22122135 | 22122271 | ENST00000299840 | VW3A |
| chr16 | 23632670 | 23632766 | ENST00000565038 | PALB2 |
| chr16 | 24672075 | 24672251 | ENST00000414816 | LINC01567 |
| chr16 | 25788417 | 25788658 | ENST00000313151 | HS3ST4 |
| chr16 | 25913791 | 25914440 | ENST00000475436 | HS3ST4 |
| chr16 | 27686666 | 27686745 | ENST00000564893 | CTD-2049O4.1 |
| chr16 | 27789760 | 27789882 | ENST00000447459 | GSG1L |
| chr16 | 27886266 | 27886316 | ENST00000447459 | GSG1L |
| chr16 | 28828388 | 28828564 | ENST00000565971 | ATXN2L |
| chr16 | 29197362 | 29197957 | ENST00000563477 | RP11-426C22.5 |
| chr16 | 29270795 | 29270884 | ENST00000622268 | RP11-426C22.8 |
| chr16 | 30477763 | 30477999 | ENST00000569725 | ITGAL |
| chr16 | 32105346 | 32105449 | ENST00000564145 | HERC2P4 |
| chr16 | 32105346 | 32105449 | ENST00000564145 | HERC2P4 |
| chr16 | 32105669 | 32105868 | ENST00000564145 | HERC2P4 |
| chr16 | 34038483 | 34038920 | ENST00000566112 | RP11-598D12.2 |
| chr16 | 34038483 | 34038920 | ENST00000566112 | RP11-598D12.2 |
| chr16 | 47883219 | 47883295 | ENST00000570024 | AC140542.2 |
| chr16 | 48396150 | 48396347 | ENST00000567973 | SIAH1 |
| Chromosome | Start | End   | Gene Description | ID       |
|------------|-------|-------|------------------|----------|
| chr16      | 49678158 | 49678227 | ENST00000408207 | AC007339.1 |
| chr16      | 50692401 | 50692983 | ENST00000526417 | NOD2     |
| chr16      | 57070660 | 57070908 | ENST00000545349 | NLRC5    |
| chr16      | 57719514 | 57719614 | ENST00000562250 | DRC7     |
| chr16      | 58304895 | 58304945 | ENST00000564814 | GINS3    |
| chr16      | 58425453 | 58425526 | ENST00000567448 | RP11-481J2.2 |
| chr16      | 61802725 | 61802886 | ENST00000577730 | CDH8     |
| chr16      | 61882648 | 61882943 | ENST00000577730 | CDH8     |
| chr16      | 65340858 | 65340980 | ENST00000562656 | RP11-256I9.3 |
| chr16      | 66790225 | 66790385 | ENST0000058713  | CCDC79   |
| chr16      | 66790225 | 66790385 | ENST0000058713  | CCDC79   |
| chr16      | 66790225 | 66790385 | ENST0000058713  | CCDC79   |
| chr16      | 68185711 | 68185775 | ENST00000391143 | SNORA48  |
| chr16      | 70642486 | 70642655 | ENST00000563721 | IL34     |
| chr16      | 75483756 | 75483914 | ENST00000530512 | RP11-77K12.4 |
| chr16      | 77660882 | 77660945 | ENST00000624623 | RP11-5106.2 |
| chr16      | 79756385 | 79756633 | ENST00000561510 | LINC01229 |
| chr16      | 80240493 | 80240671 | ENST00000568776 | RP11-525K10.3 |
| chr16      | 81689240 | 81690266 | ENST00000565680 | CMIP     |
| chr16      | 82988549 | 82988634 | ENST00000569454 | CDH13    |
| chr16      | 83734505 | 83734702 | ENST00000563981 | RP11-298D21.1 |
| chr16      | 84409163 | 84409363 | ENST00000568160 | ATP2C2   |
| chr16      | 84930353 | 84930489 | ENST00000569104 | RP11-254F19.3 |
| chr16      | 84930353 | 84930489 | ENST00000569104 | RP11-254F19.3 |
| chr16      | 87187128 | 87187956 | ENST00000562840 | C16orf95 |
| chr16      | 87209860 | 87210681 | ENST00000562840 | C16orf95 |
| chr16      | 87617611 | 87617787 | ENST00000284262 | JPH3     |
| chr16      | 88423079 | 88423240 | ENST00000565624 | ZNF469   |
| chr16      | 88518560 | 88518886 | ENST00000563243 | RP11-21B21.4 |
| chr16      | 88724400 | 88724586 | ENST00000474606 | PIEZO1   |
| chr16      | 88724400 | 88724586 | ENST00000474606 | PIEZO1   |
| chr16      | 88724400 | 88724586 | ENST00000474606 | PIEZO1   |
| chr16      | 88724400 | 88724586 | ENST00000474606 | PIEZO1   |
| chr16      | 88724400 | 88724586 | ENST00000474606 | PIEZO1   |
| chr16      | 89610705 | 89610814 | ENST00000421184 | DPEP1    |
| chr16      | 89610705 | 89610814 | ENST00000421184 | DPEP1    |
| chr16      | 89610705 | 89610814 | ENST00000421184 | DPEP1    |
| chr16      | 89610705 | 89610814 | ENST00000421184 | DPEP1    |
| chr16      | 89610705 | 89610814 | ENST00000421184 | DPEP1    |
| chr16      | 89610705 | 89610814 | ENST00000421184 | DPEP1    |
| chr16      | 89610705 | 89610814 | ENST00000421184 | DPEP1    |
| chr16      | 89610705 | 89610814 | ENST00000421184 | DPEP1    |
| Chromosome | Start Position | End Position | Gene Symbol | Description |
|------------|----------------|--------------|-------------|-------------|
| chr15      | 20394183       | 20394668     | ENST00000426501 | HERC2P3     |
| chr15      | 25528061       | 25528493     | ENST00000422117 | AC124997.1  |
| chr15      | 33351126       | 33351348     | ENST00000622037 | RYR3        |
| chr15      | 41446976       | 41447057     | ENST00000462276 | RTF1        |
| chr15      | 44146712       | 44146874     | ENST00000417257 | FRMD5       |
| chr15      | 44354179       | 44354341     | ENST00000558847 | CASC4       |
| chr15      | 45887819       | 45887989     | ENST00000559600 | RP11-718O11.1 |
| chr15      | 65272929       | 65273136     | ENST00000261888 | PARP16      |
| chr15      | 65529523       | 65529674     | ENST00000562901 | HACD3       |
| chr15      | 68643493       | 68643936     | ENST00000543950 | CORO2B      |
| chr15      | 69260317       | 69260436     | ENST00000559420 | GLCE        |
| chr15      | 69309679       | 69309972     | ENST00000558684 | PAQR5       |
| chr15      | 73134581       | 73134857     | ENST00000560328 | NEO1        |
| chr15      | 73709085       | 73709315     | ENST00000559073 | CD276       |
| chr15      | 74161338       | 74161610     | ENST00000561647 | RP11-665J16.1 |
| chr15      | 74164696       | 74164760     | ENST00000561647 | RP11-665J16.1 |
| chr15      | 74817715       | 74818097     | ENST00000488000 | RP11-414J4.2 |
| chr15      | 77021510       | 77021768     | ENST00000559856 | PSTDIP1     |
| chr15      | 77021510       | 77021768     | ENST00000559856 | PSTDIP1     |
| chr15      | 77021510       | 77021768     | ENST00000559856 | PSTDIP1     |
| chr15      | 77021510       | 77021768     | ENST00000559856 | PSTDIP1     |
| chr15      | 77021510       | 77021768     | ENST00000559856 | PSTDIP1     |
| chr15      | 77802187       | 77802431     | ENST00000566711 | LINGO1      |
| chr15      | 77927453       | 77927776     | ENST00000567226 | RP11-114H24.2 |
| chr15      | 79437184       | 79437608     | ENST00000305428 | KIAA1024    |
| chr15      | 79437184       | 79437608     | ENST00000305428 | KIAA1024    |
| chr15      | 79437184       | 79437608     | ENST00000305428 | KIAA1024    |
| chr15      | 79439170       | 79439226     | ENST00000305428 | KIAA1024    |
| chr15      | 79451938       | 79452890     | ENST00000305428 | KIAA1024    |
| chr15      | 79451938       | 79452890     | ENST00000305428 | KIAA1024    |
| chr15      | 79451938       | 79452890     | ENST00000305428 | KIAA1024    |
| chr15      | 80911867       | 80912096     | ENST00000558261 | RP11-351M8.1 |
| chr15      | 80911867       | 80912096     | ENST00000558261 | RP11-351M8.1 |
| chr15      | 80911867       | 80912096     | ENST00000558261 | RP11-351M8.1 |
| chr15      | 80911867       | 80912096     | ENST00000558261 | RP11-351M8.1 |
| chr15      | 81046732       | 81046789     | ENST00000560091 | C15orf26    |
| chr15      | 81610647       | 81610828     | ENST00000558141 | CTD-203J4.2 |
| chr15      | 83695162       | 83695356     | ENST00000565653 | ADAMTSL3    |
| chr15      | 85605384       | 85605587     | ENST00000560340 | AKAP13      |
| chr15      | 86965776       | 86965877     | ENST00000558587 | RP11-133L19.1 |
| chr15      | 86966802       | 86966992     | ENST00000558587 | RP11-133L19.1 |
| chr15      | 88100773       | 88101895     | ENST00000394480 | NTRK3       |
| Chromosome | Start Position | End Position | Gene Name | Description |
|------------|----------------|--------------|-----------|-------------|
| chr15      | 89061005       | 89061340     | ENST00000565938 | RP11-326A19.4 |
| chr15      | 89245203       | 89245520     | ENST00000565522 | FANCI        |
| chr15      | 91973018       | 91973160     | ENST00000556649 | SLC03A1      |
| chr15      | 92038457       | 92039488     | ENST00000556649 | SLC03A1      |
| chr15      | 92479745       | 92479898     | ENST00000556685 | C15orf32     |
| chr15      | 92484355       | 92484478     | ENST00000556685 | C15orf32     |
| chr15      | 93728654       | 93728964     | ENST00000554318 | RP11-739G5.1 |
| chr15      | 93846855       | 93847580     | ENST00000553477 | RP11-76E17.2 |
| chr15      | 95012840       | 95012921     | ENST00000614581 | RP11-255M2.3 |
| chr15      | 97466616       | 97466930     | ENST00000558621 | CTD-2147F2.2 |
| chr15      | 97856850       | 97857030     | ENST00000614972 | LINC00923    |
| chr15      | 97895324       | 97895742     | ENST00000401164 | AC024651.1   |
| chr15      | 98012673       | 98013127     | ENST00000554798 | AC144835.1   |
| chr15      | 98052879       | 98053079     | ENST000005560360 | CTD-254M6.1  |
| chr15      | 99584640       | 99584767     | ENST00000559903 | MEF2A        |
| chr15      | 1000058290     | 100058388    | ENST00000268070 | ADAMTS17     |
| chr15      | 100065915      | 100066083    | ENST00000268070 | ADAMTS17     |
| chr15      | 100065915      | 100066083    | ENST00000268070 | ADAMTS17     |
| chr15      | 100880804      | 100880948    | ENST00000346623 | ALDH1A3      |
| chr15      | 101496715      | 101496918    | ENST00000611487 | RP11-114C10.3 |
| chr15      | 101677776      | 101678091    | ENST00000355968 | TARSL2       |
| chr15      | 101980942      | 101981156    | ENST00000559159 | DDX11L9      |
| chr15      | 101980942      | 101981156    | ENST00000559159 | DDX11L9      |
| chr15      | 101980942      | 101981156    | ENST00000559159 | DDX11L9      |
| chr15      | 101980942      | 101981156    | ENST00000559159 | DDX11L9      |
| chr14      | 18625938       | 18626223     | ENST00000548856 | ARHGAP42P5   |
| chr14      | 18689660       | 18690124     | ENST00000484916 | RP11-536C10.1 |
| chr14      | 18923136       | 18923393     | ENST00000551565 | CTD-231B13.1 |
| chr14      | 18923136       | 18923393     | ENST00000551565 | CTD-231B13.1 |
| chr14      | 19242924       | 19243166     | ENST00000547821 | RP11-49E12.4 |
| chr14      | 19431678       | 19432206     | ENST00000547848 | POTEG        |
| chr14      | 19482667       | 19483037     | ENST00000621415 | MED15P6      |
| chr14      | 19482667       | 19483037     | ENST00000621415 | MED15P6      |
| chr14      | 19482667       | 19483037     | ENST00000621415 | MED15P6      |
| chr14      | 19664542       | 19664718     | ENST00000548456 | RP11-536C10.20 |
| chr14      | 19684798       | 19684852     | ENST00000547175 | RP11-597A11.2 |
| chr14      | 21664048       | 21664330     | ENST00000408935 | OR4E2        |
| chr14      | 21806196       | 21806971     | ENST00000390431 | TRAV9-1      |
| chr14      | 23233617       | 23233793     | ENST00000465411 | RP11-124D2.1 |
| chr14      | 24002696       | 24002822     | ENST00000560276 | DHR54L2      |
| chr14      | 25433605       | 25434900     | ENST00000547237 | RP11-388G3.1 |
| chr14      | 26747648       | 26747873     | ENST00000548328 | NOVA1-AS1    |
chr14  29807503  29807743  ENST00000516877  RNU6-1234P
chr14  30278947  30279425  ENST00000508469  CTD-2251F13.1
chr14  30730743  30730847  ENST00000553932  LINC00639
chr14  31689748  31690106  ENST00000384681  AL390335.1
chr14  37988668  37988759  ENST00000553887  TTC6
chr14  38807698  38808081  ENST00000554990  MAP4K5
chr14  41346307  41346509  ENST00000554436  CTD-2277K2.1
chr14  47225486  47225747  ENST00000557184  CGRRF1
chr14  50441780  50441830  ENST00000555378  LINC01500
chr14  58437463  58437691  ENST00000261244  KIAA0586
chr14  58889332  5889553  ENST00000555378  LINC01500
chr14  6075314  60765455  ENST00000553354  MNAT1
chr14  60887692  60887800  ENST00000553946  RP11-193F5.1
chr14  61800344  61800562  ENST00000624542  RP11-442G21.2
chr14  61900284  61900334  ENST00000555409  SYT16
chr14  62058989  62059139  ENST00000555378  LINC01500
chr14  62869649  62869859  ENST00000322893  KCNH5
chr14  63236409  63236509  ENST00000557184  CTD-2277K2.1
chr14  63858166  63858306  ENST00000322893  KCNH5
chr14  64006573  64006686  ENST00000557005  SYNE2
chr14  64765985  64766366  ENST00000557387  GPHN
chr14  65337946  65338029  ENST00000554436  CTD-2277K2.1
chr14  65694612  65694970  ENST00000554765  GPHN
chr14  66559229  66559279  ENST00000556020  GPHN
chr14  66895283  66895375  ENST00000555506  GPHN
chr14  67415891  67416049  ENST00000557388  PLEK2
chr14  68582375  68583026  ENST00000556251  RPS6KA5
chr14  72923625  72923930  ENST00000558377  DCAF4
chr14  73699403  73699746  ENST00000557304  RP4-863M11.3
chr14  74553887  74554038  ENST00000554802  SPATA7
chr14  75173207  75173395  ENST00000555873  TMED10
chr14  76662667  76627052  ENST00000554926  RP11-18707.3
chr14  85945983  85946351  ENST00000557195  CTD-2341M24.1
chr14  85971020  85971088  ENST00000557195  CTD-2341M24.1
chr14  88436100  88436291  ENST00000554802  SPATA7
chr14  90748561  90748629  ENST00000557766  TTC7B
chr14  90983539  90984009  ENST00000614987  RPS6KA5
chr14  91221365  91221571  ENST00000523576  C14orf159
chr14  98710401  98710726  ENST00000325812  C14orf177
chr14  99420926  99420991  ENST0000031768  SETD3
chr14  100046535  100046754  ENST00000554460  EVL
chr14  100284895  100285078  ENST00000553954  AL157871.2
| Chromosome | Start | End   | Gene ID      | Gene Name   |
|------------|-------|-------|--------------|-------------|
| chr14      | 101081551 | 101081788 | ENST00000556136 | AL132709.1 |
| chr14      | 102835683 | 102835809 | ENST00000351691 | TRAF3       |
| chr14      | 103480065 | 103480244 | ENST00000556744 | MARK3       |
| chr14      | 104526757 | 104526983 | ENST00000553344 | CTD-3051D23.4 |
| chr14      | 104860955 | 104861099 | ENST00000553344 | CTD-3051D23.4 |
| chr19      | 393857  | 394234 | ENST00000591757 | AC010641.1  |
| chr19      | 466746  | 466938 | ENST00000382696 | ODF3L2      |
| chr19      | 641424  | 641542 | ENST00000215530 | FGF22       |
| chr19      | 754732  | 754878 | ENST00000215530 | MISP        |
| chr19      | 842779  | 842830 | ENST00000234347 | PRTN3       |
| chr19      | 842779  | 842830 | ENST00000234347 | PRTN3       |
| chr19      | 1583198 | 1583260 | ENST00000589064 | MBD3        |
| chr19      | 1825262 | 1825495 | ENST00000587741 | CTB-31O20.4 |
| chr19      | 2277535 | 2277755 | ENST00000342063 | C19orf35    |
| chr19      | 2776831 | 2777213 | ENST00000586711 | SGTA        |
| chr19      | 2776831 | 2777213 | ENST00000586711 | SGTA        |
| chr19      | 2776831 | 2777213 | ENST00000586711 | SGTA        |
| chr19      | 2776831 | 2777213 | ENST00000586711 | SGTA        |
| chr19      | 3153816 | 3154312 | ENST00000587587 | AC005264.2  |
| chr19      | 3231648 | 3231864 | ENST00000334293 | CELF5       |
| chr19      | 3475649 | 3475827 | ENST00000215531 | SMIM24      |
| chr19      | 3528695 | 3528926 | ENST00000592214 | FZR1        |
| chr19      | 3528695 | 3528926 | ENST00000592214 | FZR1        |
| chr19      | 3528695 | 3528926 | ENST00000592214 | FZR1        |
| chr19      | 3529342 | 3529706 | ENST00000592214 | FZR1        |
| chr19      | 3529342 | 3529706 | ENST00000592214 | FZR1        |
| chr19      | 3678214 | 3678424 | ENST00000335312 | PIP5K1C     |
| chr19      | 4184887 | 4185144 | ENST0000060132  | ANKR2D4     |
| chr19      | 5674650 | 5674735 | ENST00000579649 | RPL36       |
| chr19      | 5873131 | 5873442 | ENST00000592091 | AC024592.12 |
| chr19      | 6070064 | 6070238 | ENST00000586806 | RFX2        |
| chr  |
|------|
| chr19 |
| 6070064 | 6070238 | ENST00000586806 | RFX2 |
| 6070064 | 6070238 | ENST00000586806 | RFX2 |
| 6070064 | 6070238 | ENST00000586806 | RFX2 |
| 6160829 | 6160895 | ENST00000585526 | ACSBG2 |
| 6390426 | 6390571 | ENST00000595047 | GTF2F1 |
| 9292958 | 9293181 | ENST00000591336 | CTC-325H20.4 |
| 11095592 | 11095701 | ENST00000252444 | LDLR |
| 11218147 | 11218270 | ENST00000592403 | DOCK6 |
| 13226827 | 13226923 | ENST00000614285 | CACNA1A |
| 13535047 | 13535309 | ENST00000592864 | CACNA1A |
| 13868515 | 1386867 | ENST00000591161 | NANOS3 |
| 13879589 | 13879762 | ENST00000397555 | NANOS3 |
| 14038900 | 14038980 | ENST00000263379 | IL27RA |
| 14438579 | 14438709 | ENST00000590097 | PKN1 |
| 16043294 | 16043462 | ENST00000612686 | LLNLF-136C3.1 |
| 16043294 | 16043462 | ENST00000612686 | LLNLF-136C3.1 |
| 16131528 | 16131756 | ENST00000592971 | RAB8A |
| 17318501 | 17318747 | ENST00000594501 | DDA1 |
| 18314360 | 18314471 | ENST00000593829 | LSM4 |
| 18442665 | 18442736 | ENST00000594590 | CTD-3137H5.1 |
| 18770528 | 18770789 | ENST00000601916 | CRTC1 |
| 18996964 | 18997056 | ENST00000593795 | SUGP2 |
| 18996964 | 18997056 | ENST00000593795 | SUGP2 |
| 27903816 | 27904130 | ENST00000586473 | AC022153.1 |
| 28338689 | 28338806 | ENST00000592311 | AC005780.1 |
| 28438463 | 28438846 | ENST00000592347 | AC005307.3 |
| 28462462 | 28462849 | ENST00000592347 | AC005307.3 |
| 28595194 | 28595733 | ENST00000589999 | AC005616.1 |
| 28882083 | 28882378 | ENST00000591285 | AC011524.1 |
| 28894940 | 28895155 | ENST00000587850 | AC008991.1 |
| 28894940 | 28895155 | ENST00000587850 | AC008991.1 |
| 28964555 | 28964663 | ENST00000589198 | AC011524.3 |
| 29008069 | 29008215 | ENST00000589821 | LINCO1532 |
| 29354305 | 29354495 | ENST00000582581 | CTC-525D6.1 |
| 29390919 | 29391037 | ENST00000582581 | CTC-525D6.1 |
| 29439005 | 29439257 | ENST00000582581 | CTC-525D6.1 |
| 29439005 | 29439257 | ENST00000582581 | CTC-525D6.1 |
| 29439005 | 29439257 | ENST00000582581 | CTC-525D6.1 |
| 29439005 | 29439257 | ENST00000582581 | CTC-525D6.1 |
| 29511610 | 29512194 | ENST00000579268 | CTC-525D6.2 |
| 29512681 | 29513002 | ENST00000579268 | CTC-525D6.2 |
| 29514513 | 29514745 | ENST00000579268 | CTC-525D6.2 |
| Chromosome | Start Position | End Position | Ensembl Transcript ID | Gene Name |
|------------|----------------|--------------|----------------------|-----------|
| chr19      | 29541548       | 29542708     | ENST00000335523      | VSTM2B    |
| chr19      | 29541548       | 29542708     | ENST00000335523      | VSTM2B    |
| chr19      | 29541548       | 29542708     | ENST00000335523      | VSTM2B    |
| chr19      | 29541548       | 29542708     | ENST00000335523      | VSTM2B    |
| chr19      | 29541548       | 29542708     | ENST00000335523      | VSTM2B    |
| chr19      | 29707994       | 29708243     | ENST00000623113      | C19orf12  |
| chr19      | 30011894       | 30011952     | ENST00000575242      | URI1      |
| chr19      | 30286362       | 30286715     | ENST00000591488      | ZNF536    |
| chr19      | 30355258       | 30355586     | ENST00000591488      | ZNF536    |
| chr19      | 30399546       | 30399997     | ENST00000355537      | ZNF536    |
| chr19      | 30423204       | 30423322     | ENST00000355537      | ZNF536    |
| chr19      | 30423204       | 30423322     | ENST00000355537      | ZNF536    |
| chr19      | 30480469       | 30481085     | ENST00000355537      | ZNF536    |
| chr19      | 30497956       | 30498536     | ENST00000355537      | ZNF536    |
| chr19      | 30505567       | 30505853     | ENST00000355537      | ZNF536    |
| chr19      | 30505567       | 30505853     | ENST00000355537      | ZNF536    |
| chr19      | 30533221       | 30533546     | ENST00000355537      | ZNF536    |
| chr19      | 30550479       | 30550811     | ENST00000592773      | ZNF536    |
| chr19      | 30550479       | 30550811     | ENST00000592773      | ZNF536    |
| chr19      | 31297516       | 31297623     | ENST00000240587      | TSHZ3     |
| chr19      | 31550463       | 31550688     | ENST00000593063      | CTD-2050I18.1 |
| chr19      | 31654253       | 31654563     | ENST00000516971      | RNA5S471  |
| chr19      | 31900544       | 31900651     | ENST00000592270      | CTC-360P9.1 |
| chr19      | 31904741       | 31905058     | ENST00000592270      | CTC-360P9.1 |
| chr19      | 31978593       | 31978860     | ENST00000590053      | CTC-360P9.4 |
| chr19      | 32019327       | 32019727     | ENST00000590053      | CTC-360P9.4 |
| chr19      | 32102012       | 32102390     | ENST00000591212      | AC011518.1 |
| chr19      | 32342739       | 32343506     | ENST00000311921      | ZNF507    |
| chr19      | 32364804       | 32365376     | ENST00000355898      | ZNF507    |
| chr19      | 32392099       | 32392323     | ENST00000592680      | AC007773.2 |
| chr19      | 32392099       | 32392323     | ENST00000592680      | AC007773.2 |
| chr19      | 32392099       | 32392323     | ENST00000592680      | AC007773.2 |
| chr19      | 32579878       | 32580275     | ENST00000590247      | PDCD5     |
| chr19      | 33442247       | 33442488     | ENST00000397032      | PEPD      |
| chr19      | 33457923       | 33458770     | ENST00000397032      | PEPD      |
| chr19      | 33517000       | 33517200     | ENST00000397032      | PEPD      |
| chr19      | 33517000       | 33517200     | ENST00000397032      | PEPD      |
| chr19      | 33517000       | 33517200     | ENST00000397032      | PEPD      |
| chr19      | 33517000       | 33517200     | ENST00000397032      | PEPD      |
| chr19      | 33517000       | 33517200     | ENST00000397032      | PEPD      |
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| Chromosome | Start Position | End Position | Gene ID | Gene Name |
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| chr19      | 33721790       | 3372340      | ENST00000262622 | CHST8    |
| chr19      | 33794763       | 33794944     | ENST00000587658 | KCTD15   |
| chr19      | 34612192       | 34612357     | ENST00000595326 | SCGB2B2  |
| chr19      | 34612192       | 34612357     | ENST00000595326 | SCGB2B2  |
| chr19      | 34780309       | 34780878     | ENST00000603635 | CTC-523E23.10 |
| chr19      | 34780309       | 34780878     | ENST00000603635 | CTC-523E23.10 |
| chr19      | 34798979       | 34799162     | ENST00000587150 | CTC-523E23.4 |
| chr19      | 34810461       | 34810852     | ENST00000587150 | CTC-523E23.4 |
| chr19      | 34999094       | 34999216     | ENST00000599564 | GRAMD1A  |
| chr19      | 35865195       | 35865440     | ENST00000262625 | KIRREL2  |
| chr19      | 35865195       | 35865440     | ENST00000262625 | KIRREL2  |
| chr19      | 35943724       | 35943894     | ENST00000246529 | LRFN3    |
| chr19      | 36398551       | 36398607     | ENST00000445543 | ZFP82    |
| chr19      | 37148197       | 37148517     | ENST00000292841 | ZNF585A  |
| chr19      | 37892007       | 37892430     | ENST00000447313 | WDR87    |
| chr19      | 38294815       | 38295424     | ENST00000363339 | Y_RNA    |
| chr19      | 38402005       | 38402159     | ENST00000252530 | FAM98C   |
| chr19      | 38648295       | 38648517     | ENST00000495553 | ACTN4    |
| chr19      | 38648295       | 38648517     | ENST00000495553 | ACTN4    |
| chr19      | 38748118       | 38748300     | ENST00000597740 | CAPN12   |
| chr19      | 39137650       | 39137978     | ENST00000599484 | CTC-218B8.3 |
| chr19      | 39367637       | 39368258     | ENST00000596368 | SAMD4B   |
| chr19      | 39420042       | 39420233     | ENST00000478523 | PLEKHG2  |
| chr19      | 39420042       | 39420233     | ENST00000478523 | PLEKHG2  |
| chr19      | 39420042       | 39420233     | ENST00000478523 | PLEKHG2  |
| chr19      | 39882187       | 39882248     | ENST00000616721 | FCGBP    |
| chr19      | 39993539       | 39983669     | ENST00000616721 | FCGBP    |
| chr19      | 40339847       | 40340123     | ENST00000357884 | C19orf47 |
| chr19      | 40533750       | 40534081     | ENST00000593932 | SPTBN4   |
| chr19      | 40533750       | 40534081     | ENST00000593932 | SPTBN4   |
| chr19      | 40533750       | 40534081     | ENST00000593932 | SPTBN4   |
| chr19      | 40823856       | 40823965     | ENST00000437853 | CYP2F2P  |
| chr19      | 40823856       | 40823965     | ENST00000437853 | CYP2F2P  |
| chr19      | 40880905       | 40881088     | ENST00000610301 | CYP2A6   |
| chr19      | 41091423       | 41091473     | ENST00000330436 | CYP2A13  |
| chr19      | 41091423       | 41091473     | ENST00000330436 | CYP2A13  |
| chr19      | 41137336       | 41137519     | ENST00000601990 | CYP2T3P  |
| chr19      | 41240012       | 41240400     | ENST00000593513 | AXL      |
| chr19      | 41240012       | 41240400     | ENST00000593513 | AXL      |
| chr19      | 41254414       | 41254811     | ENST00000593513 | AXL      |
| chr19      | 41255711       | 41256053     | ENST00000593513 | AXL      |
| chr19      | 41427829       | 41427966     | ENST00000601379 | B3GNT8   |
| chr19  | 41925779 | 41925918 | ENST00000594417 | ARHGEF1 |
| chr19  | 42164236 | 42164426 | ENST00000524801 | POU2F2  |
| chr19  | 42653838 | 42654021 | ENST00000614151 | CEACAM8 |
| chr19  | 43231275 | 43231878 | ENST00000489959 | CEACAMP10|
| chr19  | 43594328 | 43594419 | ENST00000602269 | IRGQ    |
| chr19  | 43772081 | 43773157 | ENST00000262888 | KCNN4   |
| chr19  | 43898333 | 43898742 | ENST00000587128 | RP11-15A1.3|
| chr19  | 43928272 | 43928509 | ENST00000269973 | ZNF45   |
| chr19  | 43975284 | 43975608 | ENST00000590411 | ZNF155  |
| chr19  | 44210981 | 44211259 | ENST00000590871 | ZNF227  |
| chr19  | 44267311 | 44267556 | ENST00000589522 | ZNF233  |
| chr19  | 44410723 | 44410835 | ENST00000588655 | CTC-512J12.4|
| chr19  | 45096250 | 45096319 | ENST00000496125 | PPP1R37 |
| chr19  | 46065135 | 46065295 | ENST00000601672 | IGFL4   |
| chr19  | 46330407 | 46330871 | ENST00000529542 | HIF3A   |
| chr19  | 47208432 | 47208517 | ENST00000392776 | SAE1    |
| chr19  | 47405701 | 47405999 | ENST00000561204 | MEIS3   |
| chr19  | 47489987 | 47490444 | ENST00000597778 | NAPA    |
| chr19  | 47769562 | 47769762 | ENST00000602048 | GLTSCR2-AS1|
| chr19  | 48032368 | 48032549 | ENST00000293255 | CNT5    |
| chr19  | 48070481 | 48070723 | ENST00000599921 | PLA2G4C |
| chr19  | 48630798 | 48631041 | ENST00000222122 | DBP     |
| chr19  | 48751844 | 48751894 | ENST00000310160 | FUT1    |
| chr19  | 48971888 | 48972269 | ENST00000472004 | GYS1    |
| chr19  | 49461274 | 49461419 | ENST00000599536 | CTD-3148I10.9|
| chr19  | 49461274 | 49461419 | ENST00000599536 | CTD-3148I10.9|
| chr19  | 49785558 | 49785630 | ENST00000597774 | AP2A1   |
| chr19  | 49987010 | 49987194 | ENST00000316763 | VRK3    |
| chr19  | 50316580 | 50316847 | ENST00000376959 | KCNC3   |
| chr19  | 50320872 | 50321000 | ENST00000376959 | KCNC3   |
| chr19  | 50681895 | 50682286 | ENST00000391813 | SHANK1  |
| chr19  | 50699753 | 50700196 | ENST00000293441 | SHANK1  |
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| chr19  | 50699753 | 50700196 | ENST00000293441 | SHANK1  |
| chr19  | 50699753 | 50700196 | ENST00000293441 | SHANK1  |
| chr19  | 50980682 | 50981420 | ENST00000594512 | CTB-147C22.9|
| chr19  | 50980682 | 50981420 | ENST00000594512 | CTB-147C22.9|
| chr19  | 51718084 | 51718271 | ENST00000601714 | HAS1    |
| chr19  | 51924445 | 51924602 | ENST00000593395 | ZNF613  |
| chr19  | 54413629 | 54414179 | ENST00000423529 | TTYH1   |
| chr19  | 54413629 | 54414179 | ENST00000423529 | TTYH1   |
| chr19  | 55671883 | 55672127 | ENST00000589456 | CTD-2537I9.12|
| Chromosome | Start Position | End Position | Gene Name   | Transcript ID |
|------------|----------------|--------------|-------------|---------------|
| chr19      | 55671883       | 55672127     | ENST00000589456 | CTD-2537I9.12 |
| chr19      | 55817027       | 55817696     | ENST00000589824 | NLRP11        |
| chr19      | 55828169       | 55828320     | ENST00000592953 | NLRP11        |
| chr19      | 56109715       | 56109765     | ENST00000587279 | ZNF787        |
| chr19      | 56197161       | 56197362     | ENST00000586855 | ZSCAN5B       |
| chr19      | 56230446       | 56230553     | ENST00000587340 | ZSCAN5A       |
| chr19      | 56599993       | 56600043     | ENST00000594944 | ZNF71         |
| chr19      | 56599993       | 56600043     | ENST00000594944 | ZNF71         |
| chr19      | 56798469       | 56799680     | ENST00000593711 | ZIM2          |
| chr19      | 57204019       | 57204069     | ENST00000536056 | ZNF264        |
| chr19      | 57463286       | 57463848     | ENST00000596831 | AC004076.9    |
| chr19      | 58332548       | 58332699     | ENST00000329665 | ZSCAN22       |
| chr19      | 58332548       | 58332699     | ENST00000329665 | ZSCAN22       |
| chr19      | 58543350       | 58543429     | ENST00000579267 | RN7SL525P     |
| chr19      | 58543350       | 58543429     | ENST00000579267 | RN7SL525P     |
| chr19      | 20730          | 20885        | ENST00000572062 | AP005530.2    |
| chr18      | 20730          | 20885        | ENST00000572062 | AP005530.2    |
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| chr18      | 160224         | 160332       | ENST00000581983 | USP14         |
| chr18      | 1102584        | 1103002      | ENST00000581556 | RP11-78F17.1  |
| chr18      | 2216655        | 2217077      | ENST00000584867 | RP11-16116.2  |
| chr18      | 2562543        | 2562858      | ENST00000583253 | RP11-715F3.2  |
| chr18      | 2884234        | 2884376      | ENST00000254528 | EMLIN2        |
| chr18      | 2888537        | 2888747      | ENST00000254528 | EMLIN2        |
| chr18      | 3318495        | 3318671      | ENST00000581556 | RP11-78F17.1  |
| chr18      | 3602371        | 3602616      | ENST00000573177 | DLGAP1-AS2    |
| chr18      | 3893632        | 3894419      | ENST00000583571 | DLGAP1-AS3    |
| chr18      | 4137259        | 4137404      | ENST00000581550 | DLGAP1        |
| chr18      | 6110425        | 6110708      | ENST00000400105 | L3MBTL4       |
| chr18      | 6209305        | 6209492      | ENST00000400105 | L3MBTL4       |
| chr18      | 7798288        | 7798405      | ENST00000400060 | PTPRM         |
| chr18      | 8498166        | 8498415      | ENST00000416112 | THEMIS3P      |
| chr18      | 8542766        | 8543168      | ENST00000584733 | AKR1B1P6      |
| Chr  | Start     | End       | Chromosome | ID       | Description     |
|------|-----------|-----------|------------|----------|-----------------|
| chr18| 10368595  | 10368686  | chr18      | ENST00000582531 | RP11-138E9.2 |
| chr18| 10539396  | 10539601  | chr18      | ENST00000583367 | NAPG          |
| chr18| 12260359  | 12260424  | chr18      | ENST00000520620 | CIDEA         |
| chr18| 12642684  | 12642865  | chr18      | ENST00000449797 | SPIRE1        |
| chr18| 13428119  | 13428302  | chr18      | ENST00000588672 | LDLRAD4-AS1   |
| chr18| 14211791  | 14211984  | chr18      | ENST00000580995 | ANKRD20A5P    |
| chr18| 15165426  | 15165476  | chr18      | ENST00000581690 | RP11-805F19.1 |
| chr18| 21511065  | 21511409  | chr18      | ENST00000580384 | GREB1L        |
| chr18| 21706748  | 21707082  | chr18      | ENST00000578646 | MIB1          |
| chr18| 22706120  | 22706508  | chr18      | ENST00000578831 | RP11-739L10.1 |
| chr18| 23174382  | 23174622  | chr18      | ENST00000420687 | CABLES1       |
| chr18| 24464914  | 24465083  | chr18      | ENST00000426880 | HRH4          |
| chr18| 25245880  | 25246137  | chr18      | ENST00000577801 | ZNF521        |
| chr18| 25303562  | 25303612  | chr18      | ENST00000580488 | ZNF521        |
| chr18| 26588211  | 26588435  | chr18      | ENST00000517037 | AC090206.1    |
| chr18| 28143942  | 28144248  | chr18      | ENST00000413878 | CDH2          |
| chr18| 29295297  | 29295615  | chr18      | ENST00000577674 | CTD-2515C13.2 |
| chr18| 31144890  | 31144950  | chr18      | ENST00000581836 | DSCAS         |
| chr18| 31411997  | 31412432  | chr18      | ENST00000581856 | DSG1-AS1      |
| chr18| 31588552  | 31588754  | chr18      | ENST00000237014 | TTR           |
| chr18| 32064535  | 32064585  | chr18      | ENST00000582018 | AC009831.1    |
| chr18| 32187462  | 32188293  | chr18      | ENST00000581184 | MEP1B         |
| chr18| 32187462  | 32188293  | chr18      | ENST00000581184 | MEP1B         |
| chr18| 32972384  | 32972643  | chr18      | ENST00000581852 | CCDC178       |
| chr18| 33939778  | 33940675  | chr18      | ENST00000261592 | NOL4          |
| chr18| 34541442  | 34541807  | chr18      | ENST00000590412 | DTNA          |
| chr18| 35405996  | 35404794  | chr18      | ENST00000612496 | RP11-322E11.2 |
| chr18| 36064205  | 36064460  | chr18      | ENST00000590898 | RPRD1A        |
| chr18| 36171894  | 36172176  | chr18      | ENST00000544274 | ELP2          |
| chr18| 36253506  | 36253760  | chr18      | ENST00000588132 | MOCOS         |
| chr18| 36553839  | 36554592  | chr18      | ENST00000591635 | FHOD3         |
| chr18| 37059493  | 37060040  | chr18      | ENST00000586135 | KIAA1328      |
| chr18| 37450028  | 37450149  | chr18      | ENST00000590112 | CELF4         |
| chr18| 44523476  | 44523659  | chr18      | ENST00000587877 | LINCO1478     |
| chr18| 46451625  | 46452295  | chr18      | ENST00000592777 | RNF165        |
| chr18| 46719777  | 46719992  | chr18      | ENST00000490739 | RP11-742D12.1 |
| chr18| 47087441  | 47087719  | chr18      | ENST00000592747 | RP11-49K24.4  |
| chr18| 47701746  | 47701961  | chr18      | ENST00000586404 | RP11-767C4.1  |
| chr18| 48032526  | 48032606  | chr18      | ENST00000535628 | ZBTB7C        |
| chr18| 50258305  | 50258365  | chr18      | ENST00000616499 | RP11-669C17.1 |
| chr18| 51408160  | 51408792  | chr18      | ENST00000583609 | RP11-267C16.1 |
| chr18| 52961844  | 52962058  | chr18      | ENST00000580146 | DCC           |
| chr18| 53013177  | 53013585  | chr18      | ENST00000580146 | DCC           |
| Chromosome | Start Base | End Base | Ensembl Gene ID | Protein Name |
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| chr18      | 53523753   | 5352836  | ENST00000582084 | RP11-671P2.1 |
| chr18      | 55363580   | 55363707 | ENST00000616053 | TCF4         |
| chr18      | 56725136   | 56725671 | ENST00000585824 | WDR7         |
| chr18      | 57572292   | 57572808 | ENST00000262093 | FECH         |
| chr18      | 58016988   | 58017004 | ENST00000577323 | AC090324.1  |
| chr18      | 59025704   | 59026062 | ENST00000587790 | OACYL9      |
| chr18      | 59482240   | 59482460 | ENST00000439986 | CCBE1        |
| chr18      | 59571381   | 59571436 | ENST00000439986 | CCBE1        |
| chr18      | 63370600   | 63370758 | ENST00000589905 | RP11-635N19.1|
| chr18      | 63790768   | 63791319 | ENST00000431370 | SERPINB7    |
| chr18      | 65633774   | 65633963 | ENST00000579862 | RP11-775G23.1|
| chr18      | 69869198   | 69869552 | ENST00000578928 | CD226        |
| chr18      | 70638498   | 70639188 | ENST00000582578 | GTSCR1       |
| chr18      | 74543421   | 74543471 | ENST00000582365 | CNDP1        |
| chr18      | 76705005   | 76705323 | ENST00000584870 | ARL2BPP1     |
| chr18      | 77225212   | 77225432 | ENST00000584843 | RP11-751H17.1|
| chr18      | 79417257   | 79417873 | ENST00000586434 | NFATC1       |
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| chr18      | 80065109   | 80065230 | ENST00000568911 | RP11-795F19.1|
| chrX       | 11333073   | 11333507 | ENST00000557448 | DUFX4L19     |
| chrX       | 11333073   | 11333507 | ENST00000557448 | DUFX4L19     |
| chrX       | 11333780   | 11334005 | ENST00000615816 | AC134882.3   |
| chrX       | 11334238   | 11334403 | ENST00000615816 | AC134882.3   |
| chrX       | 315530     | 315633   | ENST00000326153 | GTPBP6       |
| chrX       | 315530     | 315633   | ENST00000326153 | GTPBP6       |
| chrX       | 1300988    | 1301041  | ENST00000411342 | RNASSP498    |
| chrX       | 1473318    | 1473667  | ENST00000381297 | P2RY8        |
| chrX       | 1473318    | 1473667  | ENST00000381297 | P2RY8        |
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| chr | start | end   | gene_name   | transcript_id |
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| chrx | 5690586 | 5690699 | ENST00000444185 | RP11-733O18.1 |
| chrx | 5690586 | 5690699 | ENST00000444185 | RP11-733O18.1 |
| chrx | 12587916 | 12588297 | ENST00000619728 | RP11-1J4.1 |
| chrx | 13343804 | 13344028 | ENST0000045367 | GLRA2 |
| chrx | 15609193 | 15610357 | ENST00000421585 | GS1-594A7.3 |
| chrx | 16165731 | 16165850 | ENST00000435789 | RP11-431J24.2 |
| chrx | 16954884 | 16954991 | ENST00000481792 | REPS2 |
| chrx | 17718626 | 17718897 | ENST00000485305 | NHS |
| chrx | 17739656 | 17739757 | ENST00000419185 | SCML1 |
| chrx | 18100189 | 18100399 | ENST00000453902 | LINC01456 |
| chrx | 18790722 | 18790864 | ENST00000379962 | PPEF1 |
| chrx | 19005610 | 19005759 | ENST00000354791 | ADGRG2 |
| chrx | 19648367 | 19648528 | ENST00000397821 | SH3KBP1 |
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| chrx | 19713885 | 19714266 | ENST00000379698 | SH3KBP1 |
| chrx | 19730934 | 19731189 | ENST00000379698 | SH3KBP1 |
| chrx | 20068867 | 20069291 | ENST00000379651 | MAP7D2 |
| chrx | 22065566 | 22065658 | ENST00000379374 | PHEX |
| chrx | 22473484 | 22473983 | ENST00000608254 | PTCHD1-AS |
| chrx | 22664421 | 22664678 | ENST00000608254 | PTCHD1-AS |
| chrx | 24471037 | 24471099 | ENST00000441463 | PDK3 |
| chrx | 24475587 | 24475822 | ENST00000441463 | PDK3 |
| chrx | 24613751 | 24613978 | ENST00000379145 | PCYT1B |
| chrx | 24833195 | 24833534 | ENST0000049204 | POLA1 |
| chrx | 27197963 | 27198943 | ENST00000422048 | RP11-268G12.1 |
| chrx | 27208376 | 27208467 | ENST00000422048 | RP11-268G12.1 |
| chrx | 27224934 | 27225009 | ENST00000422048 | RP11-268G12.1 |
| chrx | 31190580 | 31190633 | ENST00000378723 | DMD |
| chrx | 31351584 | 31351788 | ENST00000358062 | DMD |
| chrx | 31667413 | 31667530 | ENST00000358062 | DMD |
| chrx | 31738416 | 31739057 | ENST00000358062 | DMD |
| chrx | 31771621 | 31771707 | ENST00000358062 | DMD |
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| chrx | 31954794 | 31955262 | ENST00000488902 | DMD |
| chrx | 32070687 | 32071168 | ENST00000488902 | DMD |
| chrx | 32842648 | 32842974 | ENST00000420596 | DMD |
| chrx | 32856358 | 32856754 | ENST00000420596 | DMD |
| chrx | 32903273 | 32903430 | ENST00000420596 | DMD |
| chrx | 32934851 | 32934921 | ENST00000420596 | DMD |
| chrx | 33013661 | 33013991 | ENST00000420596 | DMD |
| chrx | 33163223 | 33163445 | ENST00000420596 | DMD |
| chrx | 33216365 | 33216473 | ENST00000463609 | DMD |
| chr  | Start | End   | Gene       | Description    |
|------|-------|-------|------------|----------------|
| chrX | 33740007 | 33740710 | ENST00000439992 | RP11-305F18.1 |
| chrX | 33785341 | 33785791 | ENST00000445233 | RP11-305F18.1 |
| chrX | 34648961 | 34651702 | ENST00000378657 | CFAP47         |
| chrX | 36275157 | 36275690 | ENST00000378657 | CFAP47         |
| chrX | 36321333 | 36321475 | ENST00000378657 | CFAP47         |
| chrX | 36343661 | 36343771 | ENST00000378657 | CFAP47         |
| chrX | 38567499 | 38567549 | ENST00000475216 | TSPAN7         |
| chrX | 40110648 | 40110719 | ENST00000412952 | BCOR           |
| chrX | 40893227 | 40893505 | ENST00000419629 | SDCBPP3        |
| chrX | 40904996 | 40905211 | ENST00000342691 | RP11-77G22.2   |
| chrX | 42173499 | 42174176 | ENST00000384169 | RNU6-1124P     |
| chrX | 42675387 | 42675498 | ENST00000440002 | RP1-154K9.2    |
| chrX | 44282610 | 44282667 | ENST00000420999 | EFHC2          |
| chrX | 45073598 | 45073787 | ENST00000433797 | KDM6A          |
| chrX | 45538145 | 45539076 | ENST00000422047 | LINC01204      |
| chrX | 45590610 | 45590828 | ENST00000422047 | LINC01204      |
| chrX | 45626096 | 45627002 | ENST00000422047 | LINC01204      |
| chrX | 45896935 | 45897095 | ENST00000391045 | SNORD77        |
| chrX | 46596775 | 46597092 | ENST00000276055 | CHST7          |
| chrX | 46969641 | 46969812 | ENST00000455411 | JADE3          |
| chrX | 48038111 | 48038258 | ENST00000428463 | ZNF630         |
| chrX | 48385022 | 48385215 | ENST00000595689 | SSX4           |
| chrX | 48535033 | 48535274 | ENST00000376771 | TBC1D25        |
| chrX | 49252393 | 49252645 | ENST00000376207 | FOXP3          |
| chrX | 49528432 | 49528627 | ENST00000361446 | GAGE12B        |
| chrX | 49551707 | 49551947 | ENST00000381698 | GAGE12E        |
| chrX | 50381269 | 50381397 | ENST00000611977 | DGKK           |
| chrX | 50445558 | 50445799 | ENST00000611977 | DGKK           |
| chrX | 50688282 | 50688591 | ENST00000484922 | SHROOM4        |
| chrX | 51708513 | 51708800 | ENST00000480752 | CENPVP1        |
| chrX | 5188891 | 5189072 | ENST00000375722 | MAGED1         |
| chrX | 51899230 | 51899452 | ENST00000473931 | MAGED1         |
| chrX | 51899230 | 51899452 | ENST00000473931 | MAGED1         |
| chrX | 51899230 | 51899452 | ENST00000473931 | MAGED1         |
| chrX | 51899230 | 51899452 | ENST00000473931 | MAGED1         |
| chrX | 51899230 | 51899452 | ENST00000473931 | MAGED1         |
| chrX | 52477339 | 52477742 | ENST00000617713 | RP11-485B17.9  |
| chrX | 52519959 | 52520160 | ENST00000519579 | XAGE1B         |
| chrX | 52535580 | 52535728 | ENST00000615765 | RP11-485B17.12 |
| chrX | 5328287 | 53283067 | ENST00000485377 | IQSEC2         |
| chrX | 54283016 | 54283167 | ENST00000375169 | WNK3           |
| chrX | 54942156 | 54942332 | ENST00000375006 | PFKFB1         |
| chrX | 54991479 | 54991628 | ENST00000375006 | PFKFB1         |
| Chromosome | Start Position | End Position | Database Reference | Symbol |
|------------|----------------|--------------|-------------------|--------|
| chrX       | 55105503       | 55105643     | ENST00000616908   | RP11-266I3.8 |
| chrX       | 55105503       | 55105643     | ENST00000334118   | RP11-266I3.7 |
| chrX       | 55175561       | 55175733     | ENST00000334118   | RP11-266I3.7 |
| chrX       | 55720553       | 55720872     | ENST00000262850   | RRAGB   |
| chrX       | 55922384       | 55923181     | ENST00000452532   | RP13-188A5.1 |
| chrX       | 56624340       | 56625193     | ENST0000046028    | RP11-431N15.2 |
| chrX       | 63564195       | 63564422     | ENST00000433061   | LINC01278 |
| chrX       | 64583988       | 64584407     | ENST0000038957    | ZC3H12B |
| chrX       | 65517429       | 65517601     | ENST00000374807   | LAS1L   |
| chrX       | 66077215       | 66077502     | ENST00000438308   | EIF4BP9 |
| chrX       | 66079305       | 66079520     | ENST00000438308   | EIF4BP9 |
| chrX       | 66079305       | 66079520     | ENST00000438308   | EIF4BP9 |
| chrX       | 66439450       | 66439789     | ENST00000422490   | RP11-747I9.1 |
| chrX       | 67621311       | 67621619     | ENST00000396043   | AR      |
| chrX       | 67627906       | 67628216     | ENST00000396043   | AR      |
| chrX       | 67651025       | 67651165     | ENST00000396043   | AR      |
| chrX       | 68656136       | 68656398     | ENST00000374599   | STAR0D8 |
| chrX       | 68668170       | 68668394     | ENST00000374599   | STAR0D8 |
| chrX       | 69204825       | 69205318     | ENST00000399711   | LINC00269 |
| chrX       | 70272114       | 70272348     | ENST00000307959   | ARR3    |
| chrX       | 70272114       | 70272348     | ENST00000307959   | ARR3    |
| chrX       | 70282342       | 70282568     | ENST00000276066   | RAB41   |
| chrX       | 70440812       | 70441068     | ENST00000194900   | DLG3    |
| chrX       | 70616116       | 70616950     | ENST00000374333   | TEX11   |
| chrX       | 70654523       | 70654688     | ENST00000374333   | TEX11   |
| chrX       | 70810617       | 70810674     | ENST00000374333   | TEX11   |
| chrX       | 71139773       | 71139954     | ENST00000444034   | MED12   |
| chrX       | 71139773       | 71139954     | ENST00000444034   | MED12   |
| chrX       | 71159890       | 71160173     | ENST00000476589   | NLGN3   |
| chrX       | 71387451       | 71387674     | ENST00000478305   | TAF1    |
| chrX       | 72087919       | 72088127     | ENST00000632230   | NHSL2   |
| chrX       | 72449221       | 72449487     | ENST00000373583   | HDAC8   |
| chrX       | 72480788       | 72481106     | ENST00000373583   | HDAC8   |
| chrX       | 72519563       | 72519783     | ENST00000373583   | HDAC8   |
| chrX       | 72579837       | 72579977     | ENST00000373542   | PHKA1   |
| chrX       | 72610309       | 72610610     | ENST00000373542   | PHKA1   |
| chrX       | 74101247       | 74101677     | ENST00000602420   | FTX     |
| chrX       | 74182901       | 74183854     | ENST00000414251   | BMP2KL  |
| chrX       | 74422626       | 74422839     | ENST00000587091   | SLC16A2 |
| chrX       | 74744975       | 74745439     | ENST0000055682    | KIAA2022 |
| chrX       | 74751071       | 74751257     | ENST0000055682    | KIAA2022 |
| chrX       | 75074355       | 75074921     | ENST00000620875   | ABCB7   |
| chrX       | 75369251       | 75369379     | ENST00000373367   | ZDHHC15 |
| chrX | Start | End | Name | Description |
|-----|-------|-----|------|-------------|
| chrX | 75374015 | 75374293 | ENST00000373367 | ZDHHC15 |
| chrX | 75396702 | 75397046 | ENST00000373367 | ZDHHC15 |
| chrX | 75525986 | 75526194 | ENST00000482827 | LDHBP2 |
| chrX | 76334096 | 76334261 | ENST00000456969 | LDHBP2 |
| chrX | 77685309 | 77686097 | ENST00000624032 | ATRX |
| chrX | 77745208 | 77745728 | ENST00000624688 | ATRX |
| chrX | 77897136 | 77897245 | ENST00000481445 | COX7B |
| chrX | 77928141 | 77928198 | ENST00000602791 | RP5-1000K24.2 |
| chrX | 78318195 | 78318490 | ENST00000373304 | CYSLTR1 |
| chrX | 78761660 | 78761741 | ENST00000438336 | RPL7P54 |
| chrX | 79178023 | 79178807 | ENST00000605383 | CTHRC1P1 |
| chrX | 79368250 | 79368300 | ENST00000461357 | ITM2A |
| chrX | 80301580 | 80301831 | ENST00000614414 | CHMP1B2P |
| chrX | 80332303 | 80332714 | ENST00000614414 | CHMP1B2P |
| chrX | 80377641 | 80377712 | ENST00000538312 | FAM46D |
| chrX | 80526295 | 80526436 | ENST00000431935 | HNRNPH3P1 |
| chrX | 81412546 | 81412925 | ENST00000412589 | RPS6KA6 |
| chrX | 83875336 | 83875627 | ENST00000329312 | CYLC1 |
| chrX | 84057343 | 84057393 | ENST00000620340 | RPS6KA6 |
| chrX | 84172359 | 84172559 | ENST00000620340 | RPS6KA6 |
| chrX | 84425758 | 84425954 | ENST00000297977 | HDX |
| chrX | 85029715 | 85030478 | ENST00000622540 | APOOL |
| chrX | 85848742 | 85848901 | ENST00000421841 | SFRP12 |
| chrX | 86653597 | 86653664 | ENST00000613770 | DACH2 |
| chrX | 86687381 | 86687911 | ENST00000613770 | DACH2 |
| chrX | 86751478 | 86751968 | ENST00000484479 | DACH2 |
| chrX | 86885098 | 86885415 | ENST00000440039 | RP3-431C21.1 |
| chrX | 87533505 | 87533650 | ENST00000373314 | KLHL4 |
| chrX | 87589652 | 87589707 | ENST00000373314 | KLHL4 |
| chrX | 91956258 | 91956308 | ENST00000406881 | PCDH11X |
| chrX | 95449226 | 95449332 | ENST00000604390 | RP3-380C13.2 |
| chrX | 95680921 | 95680985 | ENST00000413955 | RPS7P13 |
| chrX | 98640859 | 98641094 | ENST00000627700 | RP11-485F13.1 |
| chrX | 100321385 | 100321718 | ENST00000420881 | PCDH19 |
| chrX | 100683093 | 100683475 | ENST00000372989 | SYTL4 |
| chrX | 100955948 | 100956241 | ENST00000332270 | RP3-341D10.1 |
| chrX | 102597446 | 102598989 | ENST00000246174 | ARMCD5 |
| chrX | 102704006 | 102704317 | ENST00000422058 | BEND7P1 |
| chrX | 103355749 | 103355952 | ENST00000372661 | WBPC1 |
| chrX | 103511291 | 103511853 | ENST00000304236 | RAB4OA |
| chrX | 103770621 | 103770803 | ENST00000434483 | PLP1 |
| chrX | 104016566 | 104016772 | ENST00000611083 | H2BFWT |
| chrX | 104068924 | 104069590 | ENST00000620307 | RP11-722G7.1 |
chrX 128499211 128500275 ENST00000449485 RP1-30E17.2
chrX 128563835 128564571 ENST00000449485 RP1-30E17.2
chrX 128710551 128710807 ENST00000416086 KRT18P44
chrX 129481616 129482375 ENST00000617310 SMARCA1
chrX 129821922 129822083 ENST00000357166 ZDHHC9
chrX 129996485 129998067 ENST00000607874 BCORL1
chrX 130263504 130263918 ENST00000370935 ENOX2
chrX 130472143 130473057 ENST00000612348 RP1-274L7.4
chrX 130640471 130640853 ENST00000370935 ENOX2
chrX 130718150 130718252 ENST00000432489 ENOX2
chrX 130980317 130981295 ENST00000451431 LINC01201
chrX 130990234 130990568 ENST00000451431 LINC01201
chrX 131419374 131419760 ENST00000416078 NCLP2
chrX 131561531 131562095 ENST00000444577 OR13K1P
chrX 131701929 131702086 ENST00000427391 FIRRE
chrX 131939527 131941180 ENST00000363717 RNA5SP514
chrX 131991831 131992232 ENST00000408077 KF459411.1
chrX 132416011 132416584 ENST00000370857 MBNL3
chrX 133086426 133086802 ENST00000511190 USP26
chrX 133555636 133555770 ENST00000370818 GPC3
chrX 133757814 133758604 ENST00000412013 RPSAP63
chrX 134386319 134386609 ENST00000370800 PHF6
chrX 134577486 134578176 ENST00000359237 PLAC1
chrX 135074778 135074867 ENST00000416078 NCLP2
chrX 135253050 135253110 ENST00000454551 RP13-210D15.4
chrX 135467113 135467313 ENST00000603663 RP11-265D19.7
chrX 135683247 135684702 ENST00000420011 SAGE2P
chrX 135722684 135722828 ENST00000594117 CT45A1
chrX 135810653 135810775 ENST00000605791 CT45A2
chrX 135943464 135943932 ENST00000448043 CT45A1P
chrX 135966857 135967098 ENST0000035963 MMGT1
chrX 136183115 136183183 ENST00000628919 FHL1
chrX 136375972 136376702 ENST00000394141 ADGRG4
chrX 136411186 136411354 ENST00000394141 ADGRG4
chrX 136926439 136926678 ENST00000431484 RP11-308D16.2
chrX 136931857 136932038 ENST00000431484 RP11-308D16.2
chrX 138972292 138972396 ENST00000626909 FGF13
chrX 139205962 139206145 ENST00000421460 FGF13
chrX 139584071 139584123 ENST00000520602 MCF2
chrX 139968203 139968390 ENST00000370540 Cxorf66
chrX 140940081 140940493 ENST00000413328 RP11-298A8.2
chrX 142178624 142178730 ENST00000423985 RP3-406C18.2
| chr  | start       | end         | enst00000507418 | gene        |
|------|-------------|-------------|-----------------|-------------|
| chrX | 156030159   | 156030754   | DDX11L16        |             |
| chr22| 15548850    | 15549092    | LA16c-60G3.6    |             |
| chr22| 15567669    | 15567863    | LA16c-60G3.8    |             |
| chr22| 15689698    | 15694209    | POTEH           |             |
| chr22| 17091721    | 17091797    | IL17RA          |             |
| chr22| 18140980    | 18141050    | TUBA8           |             |
| chr22| 18862627    | 18862699    | BCRP7           |             |
| chr22| 19995170    | 19995187    | ARVCF           |             |
| chr22| 20123328    | 20123346    | RANBP1          |             |
| chr22| 20972919    | 20972936    | AIFM3           |             |
| chr22| 22714110    | 22714150    | SOCS2P2         |             |
| chr22| 22218520    | 22218540    | ILGVIV-53       |             |
| chr22| 24066075    | 24066115    | CABIN1          |             |
| chr22| 24980793    | 24980815    | KIAA1671        |             |
| chr22| 25253050    | 25253080    | CTA-221G9.11    |             |
| chr22| 25384888    | 25384908    | LRP5L           |             |
| chr22| 25821790    | 25821810    | MYO18B          |             |
| chr22| 26191598    | 26191615    | SEZ6L           |             |
| chr22| 26427615    | 26427635    | ASPHD2          |             |
| chr22| 27285800    | 27286000    | CTA-929C8.5     |             |
| chr22| 27376476    | 27376496    | CTA-929C8.8     |             |
| chr22| 27695608    | 27695646    | RP1-213J1P__B.1 |             |
| chr22| 28690860    | 28690880    | CHEK2           |             |
| chr22| 29310746    | 29310766    | GASZL1          |             |
| chr22| 32250990    | 32251010    | RP1-90G24.10    |             |
| chr22| 32281852    | 32281872    | RP1-90G24.11    |             |
| chr22| 32413695    | 32413715    | BPIFC           |             |
| chr22| 32479709    | 32479729    | FBXO7           |             |
| chr22| 32671899    | 32671919    | SYN3            |             |
| chr22| 33164862    | 33164882    | LARGE           |             |
| chr22| 33187517    | 33187537    | LARGE           |             |
| chr22| 36909880    | 36909900    | CSF2RB          |             |
| chr22| 37246441    | 37246461    | RAC2            |             |
| chr22| 37246441    | 37246461    | RAC2            |             |
| chr22| 37286611    | 37286731    | CYTH4           |             |
| chr22| 37430636    | 37430656    | ELFN2           |             |
| chr22| 37556383    | 37556403    | CDC42E1P1       |             |
| chr22| 37556383    | 37556403    | CDC42E1P1       |             |
| chr22| 38189162    | 38189182    | PLA2G6          |             |
| chr22| 38189182    | 38189202    | PLA2G6          |             |
| Chromosome | Start Position | End Position | Ensembl Transcript ID | Gene Symbol |
|------------|----------------|--------------|----------------------|-------------|
| chr22      | 3819037        | 3819162      | ENST00000417303      | PLA2G6      |
| chr22      | 38384723       | 38385761     | ENST00000428294      | RP3-449O17.1|
| chr22      | 3978441        | 39784867     | ENST00000325157      | ENTHD1      |
| chr22      | 40378462       | 40378693     | ENST00000485962      | SGSM3       |
| chr22      | 41171279       | 41171652     | ENST00000415054      | RP1-85F18.6 |
| chr22      | 41980188       | 41980238     | ENST00000396417      | 3-Sep       |
| chr22      | 43216363       | 43216698     | ENST00000360835      | SCUBE1      |
| chr22      | 43216363       | 43216698     | ENST00000360835      | SCUBE1      |
| chr22      | 43282705       | 43282893     | ENST00000458463      | Z99756.1    |
| chr22      | 43559696       | 43559910     | ENST00000461800      | EFCAB6      |
| chr22      | 43766519       | 43766818     | ENST00000396231      | EFCAB6      |
| chr22      | 44209667       | 44209751     | ENST00000472551      | PARVG       |
| chr22      | 44900364       | 44900421     | ENST00000396103      | PHF21B      |
| chr22      | 45938268       | 45938473     | ENST00000339464      | WNT7B       |
| chr22      | 46806007       | 46806177     | ENST00000406733      | TBC1D22A    |
| chr22      | 49428455       | 49428977     | ENST00000414287      | C2orf34     |
| chr22      | 49573028       | 49573181     | ENST00000414287      | C2orf34     |
| chr22      | 49998500       | 49998882     | ENST00000341280      | IL17REL     |
| chr22      | 50166939       | 50167299     | ENST00000395842      | PANX2       |
| chr22      | 50166939       | 50167299     | ENST00000395842      | PANX2       |
| chr22      | 50166939       | 50167299     | ENST00000395842      | PANX2       |
| chr22      | 50198853       | 50199011     | ENST00000608025      | RP3-402G11.26|
| chr20      | 1918318        | 1918501      | ENST00000358771      | SIRPA       |
| chr20      | 1918318        | 1918501      | ENST00000358771      | SIRPA       |
| chr20      | 3241753        | 3241947      | ENST00000621919      | RP4-794I6.4 |
| chr20      | 3241753        | 3241947      | ENST00000621919      | RP4-794I6.4 |
| chr20      | 4137656        | 4137775      | ENST00000493223      | SMOX        |
| chr20      | 5440142        | 5440263      | ENST00000420529      | LINC00658   |
| chr20      | 30903790       | 30903845     | ENST00000615662      | AC104301.2  |
| chr20      | 32630906       | 32631366     | ENST00000608990      | C2orf203    |
| chr20      | 33171013       | 33171707     | ENST00000354932      | BPIFA2      |
| chr20      | 33171013       | 33171707     | ENST00000354932      | BPIFA2      |
| chr20      | 35213774       | 35213968     | ENST00000578222      | AL121753.1  |
| chr20      | 38758455       | 38758559     | ENST00000243903      | ACTR5       |
| chr20      | 48934749       | 48935164     | ENST00000371917      | ARFGEF2     |
| chr20      | 57350861       | 57350947     | ENST00000395841      | RAE1        |
| chr20      | 57350861       | 57350947     | ENST00000395841      | RAE1        |
| chr20      | 57680494       | 57680607     | ENST00000341744      | PMEPA1      |
| chr20      | 63948581       | 63948676     | ENST00000483710      | UCKL1       |
| chr20      | 63948581       | 63948676     | ENST00000483710      | UCKL1       |
| chr21      | 8209694        | 8210513      | ENST00000631211      | CH507-513H4.6|
| chr21      | 8209694        | 8210513      | ENST00000631211      | CH507-513H4.6|
| chr21      | 8212438        | 8212657      | ENST00000612463      | RNA5-8S5    |
| Chromosome | Start | End   | Gene Name         | Feature       | Description       |
|------------|-------|-------|-------------------|---------------|-------------------|
| chr21      | 8245609 | 8246507 | ENST00000616483  | MIR6724-2     |                  |
| chr21      | 8256838 | 8257035 | ENST00000610460  | RNA5-8S5      |                  |
| chr21      | 8258210 | 8258509 | ENST00000611393  | FP671120.6    |                  |
| chr21      | 8392757 | 8393574 | ENST00000625598  | CH507-513H4.4|                  |
| chr21      | 8392757 | 8393574 | ENST00000625598  | CH507-513H4.4|                  |
| chr21      | 8395474 | 8395853 | ENST00000613359  | RNA5-8S5      |                  |
| chr21      | 8395474 | 8395853 | ENST00000613359  | RNA5-8S5      |                  |
| chr21      | 8428688 | 8429566 | ENST00000617390  | MIR6724-4     |                  |
| chr21      | 8439908 | 8440068 | ENST00000619471  | RNA5-8S5      |                  |
| chr21      | 9099097 | 9099266 | ENST00000459307  | CR392039.1    |                  |
| chr21      | 10437579| 10437635| ENST00000470054  | BAGE2         |                  |
| chr21      | 10451374| 10451513| ENST00000470054  | BAGE2         |                  |
| chr21      | 10551211| 10551470| ENST00000618007  | TPTE          |                  |
| chr21      | 10617119| 10617684| ENST00000614260  | SLC25A15P4    |                  |
| chr21      | 10617119| 10617684| ENST00000614260  | SLC25A15P4    |                  |
| chr21      | 14044487| 14044636| ENST00000448463  | AP001347.6    |                  |
| chr21      | 14540777| 14541221| ENST00000493640  | SAMS1N        |                  |
| chr21      | 14620095| 14620313| ENST00000469393  | AF165138.7    |                  |
| chr21      | 16202386| 16202632| ENST00000602505  | MIR99AHG      |                  |
| chr21      | 16394105| 16394179| ENST00000602339  | MIR99AHG      |                  |
| chr21      | 16785548| 16785841| ENST00000444868  | AP000473.6    |                  |
| chr21      | 17993787| 17993920| ENST00000400127  | CHODL         |                  |
| chr21      | 18060303| 18060446| ENST00000400127  | CHODL         |                  |
| chr21      | 18071247| 18071422| ENST00000400127  | CHODL         |                  |
| chr21      | 18400965| 18401601| ENST00000284885  | TMRPSS15      |                  |
| chr21      | 18596587| 18597075| ENST00000437492  | AL109763.2    |                  |
| chr21      | 21074923| 21075149| ENST00000400546  | NCAM2         |                  |
| chr21      | 21225177| 21225320| ENST00000400546  | NCAM2         |                  |
| chr21      | 21778729| 21778926| ENST00000430060  | LINCO1425     |                  |
| chr21      | 23281526| 23281726| ENST00000411146  | RNU2-55P      |                  |
| chr21      | 24518908| 24519231| ENST00000415182  | AP000476.1    |                  |
| chr21      | 26401023| 26401433| ENST00000414486  | CYYR1-AS1     |                  |
| chr21      | 26520925| 26521089| ENST00000299340  | CYYR1         |                  |
| chr21      | 26533651| 2653705 | ENST00000299340  | CYYR1         |                  |
| chr21      | 26569394| 26569577| ENST00000299340  | CYYR1         |                  |
| chr21      | 28113553| 28133875| ENST00000453420  | AL035610.2    |                  |
| chr21      | 29089858| 29089927| ENST00000286791  | MAP3K7CL      |                  |
| chr21      | 29336690| 29336884| ENST00000468059  | BACH1         |                  |
| chr21      | 30543974| 30544107| ENST00000614763  | KRTAP19-7     |                  |
| chr21      | 30803980| 30805088| ENST00000440620  | KRTAP8-2P     |                  |
| chr21      | 32480669| 32480851| ENST00000464037  | EVA1C         |                  |
| chr21      | 32586145| 32586957| ENST00000582575  | TCP10L        |                  |
| chr21      | 32977690| 32978010| ENST00000454622  | AP000282.2    |                  |
| Chromosome | Start | End | Gene Symbol | Description |
|------------|-------|-----|-------------|-------------|
| chr21      | 34136238 | 34136472 | ENST00000415238 | RPS5P2       |
| chr21      | 35413300 | 35413421 | ENST00000467692 | RUNX1        |
| chr21      | 36168260 | 36168450 | ENST00000492760 | DOPEY2       |
| chr21      | 37614280 | 37614463 | ENST00000609713 | KCNJ6        |
| chr21      | 37614280 | 37614463 | ENST00000609713 | KCNJ6        |
| chr21      | 37614280 | 37614463 | ENST00000609713 | KCNJ6        |
| chr21      | 37614280 | 37614463 | ENST00000609713 | KCNJ6        |
| chr21      | 37614280 | 37614463 | ENST00000609713 | KCNJ6        |
| chr21      | 38091031 | 38091466 | ENST00000398948 | DSCR4        |
| chr21      | 38485258 | 38483018 | ENST00000398907 | ERG          |
| chr21      | 38998080 | 38999563 | ENST00000417335 | AF064858.8   |
| chr21      | 39521424 | 39521736 | ENST00000411867 | AF121897.4   |
| chr21      | 40620178 | 40620489 | ENST00000441910 | DSCAM-IT1    |
| chr21      | 41179416 | 41179580 | ENST00000328735 | BACE2        |
| chr21      | 41531564 | 41531802 | ENST00000489201 | TMPRSS2      |
| chr21      | 41567437 | 41567610 | ENST00000415820 | AP001610.9   |
| chr21      | 41576996 | 41575980 | ENST00000418874 | AP006748.1   |
| chr21      | 42267677 | 42267990 | ENST00000398437 | ABCG1        |
| chr21      | 42267677 | 42267990 | ENST00000398437 | ABCG1        |
| chr21      | 42267677 | 42267990 | ENST00000398437 | ABCG1        |
| chr21      | 42267677 | 42267990 | ENST00000398437 | ABCG1        |
| chr21      | 42372505 | 42372596 | ENST00000476848 | TMPRSS3      |
| chr21      | 43750820 | 43751169 | ENST00000626421 | AP001052.1   |
| chr21      | 43907022 | 43907211 | ENST00000327505 | AGPAT3       |
| chr21      | 43997681 | 43997778 | ENST00000516797 | RN6-1150P    |
| chr21      | 44396486 | 44396724 | ENST00000498430 | TRPM2        |
| chr21      | 44396486 | 44396724 | ENST00000498430 | TRPM2        |
| chr21      | 44439675 | 44439870 | ENST00000583496 | snoZ6        |
| chr21      | 44911078 | 44911298 | ENST00000397857 | ITGB2        |
| chr21      | 45168142 | 45168195 | ENST00000629643 | ADARB1       |
| chr21      | 45168142 | 45168195 | ENST00000629643 | ADARB1       |
| chr21      | 45168142 | 45168195 | ENST00000629643 | ADARB1       |
| chr21      | 45168142 | 45168195 | ENST00000629643 | ADARB1       |
| chr21      | 45168142 | 45168195 | ENST00000629643 | ADARB1       |
| chr21      | 45168142 | 45168195 | ENST00000629643 | ADARB1       |
| chr21      | 45168142 | 45168195 | ENST00000629643 | ADARB1       |
| chr21      | 45168142 | 45168195 | ENST00000629643 | ADARB1       |
| chr21      | 45168142 | 45168195 | ENST00000629643 | ADARB1       |
| chr21      | 45168142 | 45168195 | ENST00000629643 | ADARB1       |
| chr21      | 45168142 | 45168195 | ENST00000629643 | ADARB1       |
| chr21      | 45168142 | 45168195 | ENST00000629643 | ADARB1       |
| chr21      | 45508181 | 45508526 | ENST00000473212 | COL18A1      |
| chr21      | 45508181 | 45508526 | ENST00000473212 | COL18A1      |
| chr21      | 45508181 | 45508526 | ENST00000473212 | COL18A1      |
| Chromosome | Start | End   | Gene             | Accession   |
|------------|-------|-------|------------------|-------------|
| chr21      | 45508181 | 45508526 | ENST00000473212 | COL18A1     |
| chr21      | 45712044 | 45712094 | ENST000006594149 | PCBP3       |
| chr21      | 45732797 | 45732848 | ENST00000628776  | PCBP3       |
| chr21      | 46123614 | 46124246 | ENST00000413758  | COL6A2      |
| chr21      | 46123614 | 46124246 | ENST00000413758  | COL6A2      |
| chr21      | 46123614 | 46124246 | ENST00000413758  | COL6A2      |
| chr7       | 892602   | 893317  | ENST00000464468  | GET4        |
| chr7       | 905398   | 906490  | ENST00000617043  | ADAP1       |
| chr7       | 905398   | 906490  | ENST00000617043  | ADAP1       |
| chr7       | 905398   | 906490  | ENST00000617043  | ADAP1       |
| chr7       | 905398   | 906490  | ENST00000617043  | ADAP1       |
| chr7       | 1051712  | 1051961 | ENST00000474396  | GPR146      |
| chr7       | 1051712  | 1051961 | ENST00000474396  | GPR146      |
| chr7       | 1051712  | 1051961 | ENST00000474396  | GPR146      |
| chr7       | 1051712  | 1051961 | ENST00000474396  | GPR146      |
| chr7       | 1618701  | 1619079 | ENST00000421380  | AC074389.5  |
| chr7       | 1618701  | 1619079 | ENST00000421380  | AC074389.5  |
| chr7       | 1618701  | 1619079 | ENST00000421380  | AC074389.5  |
| chr7       | 1618701  | 1619079 | ENST00000421380  | AC074389.5  |
| chr7       | 1618701  | 1619079 | ENST00000421380  | AC074389.5  |
| chr7       | 1618701  | 1619079 | ENST00000421380  | AC074389.5  |
| chr7       | 1690357  | 1690874 | ENST00000424383  | ELFN1       |
| chr7       | 2931719  | 2931773 | ENST00000396946  | CARD11      |
| chr7       | 14649392 | 14649608 | ENST00000403963  | DGKB        |
| chr7       | 14733717 | 14733949 | ENST00000403963  | DGKB        |
| chr7       | 16486503 | 16486632 | ENST00000396652  | SOSTDC1     |
| chr7       | 19375380 | 19375557 | ENST00000412563  | AC007091.1  |
| chr7       | 19532834 | 19533185 | ENST00000412563  | AC007091.1  |
| chr7       | 22460188 | 22460238 | ENST00000406890  | STEAP1B     |
| chr7       | 26803638 | 26803845 | ENST00000345317  | SKAP2       |
| chr7       | 27046406 | 27046683 | ENST00000396362  | NHP2P2      |
| chr7       | 36488935 | 36489098 | ENST00000435254  | AC006960.7  |
| chr7       | 38362148 | 38362292 | ENST00000426402  | TRFG2       |
| chr7       | 39658995 | 39659127 | ENST00000436179  | RALA        |
| chr7       | 40005869 | 40006002 | ENST00000484589  | CDK13       |
| chr7       | 42900864 | 42901035 | ENST00000569883  | RP11-111K18.2 |
| chr7       | 43049322 | 43049515 | ENST00000628203  | AC005537.2  |
| chr7       | 43074222 | 43074273 | ENST00000631088  | AC005537.2  |
| chr7       | 44021978 | 44022036 | ENST00000418424  | POLR2J4     |
| chr7       | 44056081 | 44056246 | ENST00000449997  | DBNL        |
| chr7       | 45812322 | 45812876 | ENST00000609439  | RP11-638I8.1 |
chr7  45812322  45812876  ENST00000609439  RP11-638I8.1
chr7  50777662  50777952  ENST00000335866  GRB10
chr7  55678796  55678958  ENST00000432235  RP11-310H4.6
chr7  56401282  56401363  ENST00000411398  RNU6-1052P
chr7  56401282  56401363  ENST00000411398  RNU6-1052P
chr7  57828817  57829158  ENST00000430646  RP11-548K12.12
chr7  63013691  63013923  ENST00000384712  RNU6-417P
chr7  65527554  65527787  ENST00000439631  RP11-667F9.1
chr7  70333791  70333892  ENST00000430646  RP11-548K12.12
chr7  71686321  71686550  ENST00000363070  RN7SKP75
chr7  71686321  71686550  ENST00000363070  RN7SKP75
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chr7  71921057  71921235  ENST00000329008  CALN1
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chr7  76230595  76230852  ENST00000611745  SRRM3
chr7  76342922  76343007  ENST00000307630  YWHAG
chr7  76342922  76343007  ENST00000307630  YWHAG
chr7  76997076  76998212  ENST00000579700  DTX2P1-UPK3BP1-PM22P11
chr7  76998872  76999024  ENST00000579700  DTX2P1-UPK3BP1-PM22P11
chr7  78056167  78056789  ENST00000628980  MAGI2
chr7  78341481  78342903  ENST00000628980  MAGI2
chr7  78523651  78523701  ENST00000517762  MAGI2
chr7  82902382  82902453  ENST00000333891  PCLO
chr7  84227827  84227999  ENST00000448879  SEMA3A
chr7  87612359  87612604  ENST00000416177  ABCB1
chr7  88728454  88728504  ENST0000044032  AC002127.4
chr7  90256246  90256400  ENST00000457170  CFAP69
chr7  90447941  90448121  ENST00000451941  CLDN12
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chr7  90870020  90870405  ENST00000481745  CDK14
chr7  93773201  93773325  ENST00000457396  AC002075.3
chr7  95606586  95606636  ENST00000432265  AC00251.3
chr7  101046759 101046994  ENST00000470303  MUC17
chr7  102492687 102492886  ENST00000477184  RASA4B
| Chr | Start | End   | Gene Symbol | Description |
|-----|-------|-------|-------------|-------------|
| chr7 | 102513846 | 102514077 | ENST00000465829 | RASA4B |
| chr7 | 102599160 | 102599431 | ENST00000262940 | RASA4 |
| chr7 | 102690768 | 102690829 | ENST00000460726 | RASA4DP |
| chr7 | 104542912 | 104543245 | ENST00000318724 | ATXN7L1 |
| chr7 | 105778371 | 105778581 | ENST00000418724 | TFEC |
| chr7 | 105982836 | 105982909 | ENST00000496633 | CDHR3 |
| chr7 | 109761957 | 109762169 | ENST000004629084 | DOCK4 |
| chr7 | 11181778 | 11182066 | ENST00000262940 | RASA4 |
| chr7 | 111926444 | 111926687 | ENST000004629084 | DOCK4 |
| chr7 | 112417414 | 112419268 | ENST00000318724 | ATXN7L1 |
| chr7 | 114510655 | 114511236 | ENST00000318724 | ATXN7L1 |
| chr7 | 114601001 | 114601147 | ENST00000318724 | ATXN7L1 |
| chr7 | 115963631 | 115963840 | ENST00000318724 | ATXN7L1 |
| chr7 | 116109301 | 116110108 | ENST00000318724 | ATXN7L1 |
| chr7 | 117462949 | 117462712 | ENST00000318724 | ATXN7L1 |
| chr7 | 122587988 | 122588234 | ENST00000318724 | ATXN7L1 |
| chr7 | 123130319 | 123130675 | ENST00000318724 | ATXN7L1 |
| chr7 | 126907414 | 126907648 | ENST00000318724 | ATXN7L1 |
| chr7 | 126927987 | 126928343 | ENST00000318724 | ATXN7L1 |
| chr7 | 128898149 | 128898240 | ENST00000318724 | ATXN7L1 |
| chr7 | 13119249 | 131195829 | ENST00000318724 | ATXN7L1 |
| chr7 | 132493696 | 132493758 | ENST00000318724 | ATXN7L1 |
| chr7 | 133439228 | 133439364 | ENST00000318724 | ATXN7L1 |
| chr7 | 133582121 | 133582195 | ENST00000318724 | ATXN7L1 |
| chr7 | 133592503 | 133592606 | ENST00000318724 | ATXN7L1 |
| chr7 | 139719166 | 139719328 | ENST00000318724 | ATXN7L1 |
| chr7 | 139719166 | 139719328 | ENST00000318724 | ATXN7L1 |
| chr7 | 150967159 | 150967245 | ENST00000318724 | ATXN7L1 |
| chr7 | 150967159 | 150967245 | ENST00000318724 | ATXN7L1 |
| chr7 | 150999730 | 150999876 | ENST00000318724 | ATXN7L1 |
| chr7 | 150999730 | 150999876 | ENST00000318724 | ATXN7L1 |
| chr7 | 150999730 | 150999876 | ENST00000318724 | ATXN7L1 |
| chr7 | 150999730 | 150999876 | ENST00000318724 | ATXN7L1 |
| chr7 | 156498066 | 156498322 | ENST00000318724 | ATXN7L1 |
| chr7 | 157874730 | 157875059 | ENST00000318724 | ATXN7L1 |
| chr7 | 158174298 | 158174426 | ENST00000318724 | ATXN7L1 |
| chr7 | 158809364 | 158809521 | ENST00000318724 | ATXN7L1 |
| chr6 | 309547 | 310303 | ENST00000318724 | DUSP22 |
| chr6 | 725544 | 726793 | ENST00000318724 | DUSP22 |
chr6 1691100 1691512 ENST00000530927 GMDS
chr6 2405732 2405938 ENST00000606884 GMDS-AS1
chr6 2468097 2468548 ENST00000606884 GMDS-AS1
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chr6 2972496 2973141 ENST00000377639 SERPINB6
chr6 3303489 3303747 ENST00000436008 SLC22A23
chr6 3613742 3614149 ENST00000443445 RP1-223B1.1
chr6 4036166 4036406 ENST00000337659 PRPF4B
chr6 4188902 4189129 ENST00000403917 RP3-400B16.2
chr6 5126669 5127027 ENST00000330636 LYRM4
chr6 5227470 5228169 ENST00000330636 LYRM4
chr6 5666798 5667073 ENST00000454882 RP3-380B8.4
chr6 6164108 6164282 ENST00000264870 F13A1
chr6 6185554 6185819 ENST00000264870 F13A1
chr6 6460180 6460409 ENST00000435641 LY86-AS1
chr6 6520215 6520463 ENST00000435641 LY86-AS1
chr6 7157371 7157761 ENST00000483150 RREB1
chr6 10021574 10021644 ENST00000485268 OFCC1
chr6 11726157 11726413 ENST00000505099 ADTRP
chr6 13293293 13293616 ENST00000421203 TBC1D7
chr6 13384074 13384241 ENST00000379284 GFOD1
chr6 13602394 13602560 ENST00000458288 SIRT5
chr6 16525356 16525634 ENST00000244769 ATXN1
chr6 16678921 16679426 ENST00000244769 ATXN1
chr6 18309688 18309786 ENST00000363811 RNU6-263P
chr6 18570882 18570932 ENST00000385041 MIR548A1
chr6 19584206 19584823 ENST00000432171 RP1-167F1.2
chr6 19702274 19702411 ENST00000450310 RP3-471C18.2
chr6 20282019 20282271 ENST00000449143 RP11-239H6.2
chr6 20609691 20610416 ENST00000378610 CDKAL1
chr6 20677328 20677466 ENST00000378610 CDKAL1
chr6 21781902 21782343 ENST00000607048 CASC15
chr6 22074603 22075002 ENST00000444285 CASC15
chr6 22283296 22283421 ENST00000561912 RP3-404K8.2
chr6 22284054 22284181 ENST00000561912 RP3-404K8.2
chr6 22760929 22761202 ENST00000420572 RP1-209A6.1
chr6 22768115 22768278 ENST00000420572 RP1-209A6.1
chr6 22916116 22916307 ENST00000420572 RP1-209A6.1
| Chr  | Start       | End         | Gene Name     |
|------|-------------|-------------|---------------|
| chr6 | 23001433    | 23001527    | ENST00000420572 | RP1-209A6.1 |
| chr6 | 24434205    | 24434255    | ENST00000492917 | GPLD1       |
| chr6 | 24649037    | 24649535    | ENST00000378198 | TDP2        |
| chr6 | 25015938    | 25016038    | ENST00000606385 | RP11-367G6.3 |
| chr6 | 25871386    | 25871513    | ENST00000397060 | SLC17A3     |
| chr6 | 26979249    | 26979428    | ENST00000606878 | LINC00240   |
| chr6 | 34033729    | 34033878    | ENST00000535756 | GRM4        |
| chr6 | 34296380    | 34296587    | ENST00000605528 | RPS10-NUDT3 |
| chr6 | 34323122    | 34323451    | ENST00000535756 | RPS10-NUDT3 |
| chr6 | 34330265    | 34330445    | ENST00000605528 | RPS10-NUDT3 |
| chr6 | 34336242    | 34336472    | ENST00000605528 | RPS10-NUDT3 |
| chr6 | 34410809    | 34411056    | ENST00000605528 | RPS10-NUDT3 |
| chr6 | 35121371    | 35121680    | ENST00000504758 | TCP11       |
| chr6 | 35138452    | 35138692    | ENST00000504758 | TCP11       |
| chr6 | 36259539    | 36259855    | ENST00000388715 | PNPLA1      |
| chr6 | 36329653    | 36329979    | ENST00000437635 | C6orf222    |
| chr6 | 37833659    | 37833899    | ENST00000496478 | RN7SL285P   |
| chr6 | 38088091    | 38088441    | ENST00000440482 | ZFAND3      |
| chr6 | 38230306    | 38230414    | ENST00000314100 | BTBD9       |
| chr6 | 38312615    | 38312665    | ENST00000314100 | BTBD9       |
| chr6 | 38401126    | 38401398    | ENST00000314100 | BTBD9       |
| chr6 | 38435144    | 38435326    | ENST00000314100 | BTBD9       |
| chr6 | 38715279    | 38715487    | ENST00000327475 | DNAH8       |
| chr6 | 39319559    | 39319682    | ENST00000373229 | KCNK16      |
| chr6 | 39920753    | 39921028    | ENST00000373181 | MOCS1       |
| chr6 | 40393001    | 40393107    | ENST00000631249 | AL591063.1  |
| chr6 | 41044605    | 41044774    | ENST00000470917 | TSPO2       |
| chr6 | 41403638    | 41403726    | ENST00000623968 | RP1-149M18.4 |
| chr6 | 42111216    | 42111586    | ENST00000341865 | C6orf132    |
| chr6 | 43116800    | 43116964    | ENST00000481273 | PTK7        |
| chr6 | 43652766    | 43652966    | ENST00000372163 | RSPH9       |
| chr6 | 44156100    | 44156264    | ENST00000533121 | TMEM63B     |
| chr6 | 44225255    | 44225365    | ENST00000371713 | SLC29A1     |
| chr6 | 44394997    | 44395208    | ENST00000371477 | CDC5L       |
| chr6 | 52379215    | 52379594    | ENST00000360726 | PAQR8       |
| chr6 | 52462941    | 52463006    | ENST00000538167 | EFHC1       |
| chr6 | 52851826    | 52851935    | ENST00000619736 | GSTA5       |
| chr6 | 53000702    | 53001093    | ENST0000050082  | ICK         |
| chr6 | 53197618    | 53197735    | ENST00000407803 | SOD1P1      |
| chr6 | 54222978    | 54223184    | ENST00000514433 | MLIP        |
| chr6 | 54317340    | 54317418    | ENST00000370864 | TINAG       |
| chr6 | 55253080    | 55253954    | ENST00000370862 | HCRTR2      |
| chr6 | 55839473    | 55839597    | ENST00000370830 | BMP5        |
| Chr  | Start  | End    | Ensembl Gene ID | Description |
|------|--------|--------|-----------------|-------------|
| chr6 | 6158698| 6158907| ENST00000624857| AL356135.1  |
| chr6 | 61672317| 61672741| ENST00000511849| RP1-240B8.3 |
| chr6 | 62124491| 62124693| ENST00000281156| KHDRBS2     |
| chr6 | 62255834| 62256033| ENST00000281156| KHDRBS2     |
| chr6 | 63323743| 63323926| ENST00000622415| LGSN        |
| chr6 | 64707156| 64707687| ENST00000330816| EYS         |
| chr6 | 64731110| 64732278| ENST00000433531| RP11-307F22.2 |
| chr6 | 67469729| 67470956| ENST00000516156| RNA5SP208   |
| chr6 | 68057212| 68058122| ENST00000449928| RP11-542F9.1 |
| chr6 | 68744515| 68744803| ENST00000546190| ADGRB3      |
| chr6 | 68838949| 68839174| ENST00000546190| ADGRB3      |
| chr6 | 68897701| 68897807| ENST00000546190| ADGRB3      |
| chr6 | 69114256| 69115467| ENST00000546190| ADGRB3      |
| chr6 | 69754776| 69755494| ENST00000370577| LMBRD1      |
| chr6 | 70453997| 70455097| ENST00000393299| FAM135A     |
| chr6 | 70496843| 70496952| ENST00000425415| FAM135A     |
| chr6 | 70939621| 70939782| ENST00000230053| B3GAT2      |
| chr6 | 71128764| 71129158| ENST00000408418| U3          |
| chr6 | 71887235| 71887462| ENST00000264839| RIMS1       |
| chr6 | 71887235| 71887462| ENST00000264839| RIMS1       |
| chr6 | 71923640| 71923923| ENST00000264839| RIMS1       |
| chr6 | 72011141| 72071191| ENST00000264839| RIMS1       |
| chr6 | 72240699| 72241052| ENST00000524197| RIMS1       |
| chr6 | 72679400| 72679613| ENST00000445310| KCNQ5-IT1   |
| chr6 | 73775816| 73775966| ENST00000287097| CD109       |
| chr6 | 74136880| 74137107| ENST00000435946| RP11-554D15.1 |
| chr6 | 74238050| 74238175| ENST00000435946| RP11-554D15.1 |
| chr6 | 74238050| 74238175| ENST00000435946| RP11-554D15.1 |
| chr6 | 74574742| 74574801| ENST00000432484| RP11-554D15.3 |
| chr6 | 74593267| 74593515| ENST00000432484| RP11-554D15.3 |
| chr6 | 76056947| 76057172| ENST00000369950| IMPG1       |
| chr6 | 83283266| 83283493| ENST00000369705| ME1         |
| chr6 | 83642877| 83643382| ENST00000521485| SNAP91      |
| chr6 | 83866718| 83866796| ENST00000369679| CYB5R4      |
| chr6 | 84163898| 84165040| ENST00000461137| CEP162      |
| chr6 | 84436355| 84437006| ENST00000454981| LINCO1611   |
| chr6 | 85682390| 85682689| ENST00000364995| SNORD50B    |
| chr6 | 86958136| 86958235| ENST00000305344| HTR1E       |
| chr6 | 88716790| 88716903| ENST00000369485| RNGTT       |
| chr6 | 88807031| 88807217| ENST00000369485| RNGTT       |
| chr6 | 89371326| 89371450| ENST00000369415| RRAGD       |
| Chr | Start | End   | Gene      | Ensembl  | Description      |
|-----|-------|-------|-----------|----------|------------------|
| chr6| 93284747 | 93284881 | ENST00000369303 | EPHA7   |
| chr6| 93352731 | 93353147 | ENST00000369303 | EPHA7   |
| chr6| 96560011 | 96560187 | ENST00000541107 | FHL5    |
| chr6| 97241584 | 97241712 | ENST00000275053 | MMS22L  |
| chr6| 97867447 | 97867618 | ENST00000607823 | RP11-436D23.1 |
| chr6| 97904777 | 97905199 | ENST00000606913 | RP11-436D23.1 |
| chr6| 98876702 | 98876935 | ENST00000369244 | FBXL4   |
| chr6| 101635352 | 101636435 | ENST00000318991 | GRIK2   |
| chr6| 101758041 | 101758205 | ENST00000455610 | GRIK2   |
| chr6| 101951480 | 101951585 | ENST00000487161 | GRIK2   |
| chr6| 106203995 | 106204200 | ENST00000343245 | ATG5    |
| chr6| 106721837 | 106721955 | ENST00000606261 | RP1-60O19.1 |
| chr6| 106721837 | 106721955 | ENST00000606261 | RP1-60O19.1 |
| chr6| 108880683 | 108880872 | ENST00000414610 | ARMC2   |
| chr6| 108880683 | 108880872 | ENST00000414610 | ARMC2   |
| chr6| 108880683 | 108880872 | ENST00000414610 | ARMC2   |
| chr6| 109639092 | 109639297 | ENST00000368948 | AK9     |
| chr6| 110344859 | 110345906 | ENST00000338882 | METTL24 |
| chr6| 111733747 | 111734171 | ENST00000523322 | FYN     |
| chr6| 113578341 | 113578668 | ENST00000402798 | RP11-367G18.2 |
| chr6| 113578341 | 113578668 | ENST00000402798 | RP11-367G18.2 |
| chr6| 116487943 | 116488136 | ENST00000420595 | RP11-259P20.1 |
| chr6| 117313384 | 117313441 | ENST00000368508 | ROS1    |
| chr6| 118869241 | 118869431 | ENST00000316316 | MCM9    |
| chr6| 118991260 | 118991714 | ENST00000352896 | FAM184A |
| chr6| 119214941 | 119215075 | ENST00000368468 | MAN1A1  |
| chr6| 122634178 | 122634263 | ENST00000392490 | PKIB    |
| chr6| 122705696 | 122705880 | ENST00000258014 | PKIB    |
| chr6| 123014249 | 123014299 | ENST00000368438 | CLVS2   |
| chr6| 124221329 | 124221436 | ENST00000545433 | NKAIN2  |
| chr6| 125126212 | 125126349 | ENST00000534368 | TPD52L1 |
| chr6| 125636003 | 125636497 | ENST00000606334 | RP11-624M8.1 |
| chr6| 125822742 | 125822924 | ENST00000419660 | NCOA7   |
| chr6| 125830548 | 125830664 | ENST00000419660 | NCOA7   |
| chr6| 130080089 | 130080249 | ENST00000533890 | L3MBTL3 |
| chr6| 130152503 | 130152556 | ENST00000415964 | RP11-73O6.3 |
| chr6| 131011890 | 131012239 | ENST00000528179 | EPB41L2 |
| chr6| 131143222 | 131143611 | ENST00000366358 | AKAP7   |
| chr6| 131857332 | 131857690 | ENST00000459624 | ENPP1   |
| chr6| 132626853 | 132627879 | ENST00000367931 | TAAR2   |
| chr6| 133880727 | 13388127 | ENST00000525614 | EYA4    |
| chr6| 133832129 | 133832559 | ENST00000419627 | TARID   |
chr6  134274731  134274975  ENST00000524929  SGK1
chr6  134393568  134393750  ENST00000418701  CHCHD2P4
chr6  135470630  135470826  ENST00000531788  AHI1
chr6  135688316  135688655  ENST00000579944  LINC00271
chr6  136130968  136131115  ENST00000417643  RP13-143G15.4
chr6  136352112  136352363  ENST00000617204  MAP7
chr6  136370678  136370880  ENST00000617204  MAP7
chr6  138457128  138457218  ENST00000426841  NHSL1
chr6  138476438  138476537  ENST00000479393  NHSL1
chr6  142427556  142427669  ENST00000472054  ADGRG6
chr6  142808443  142808754  ENST00000367604  HIVEP2
chr6  144137201  144137625  ENST00000401492  MRPL42P3
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chr6  144389572  144389756  ENST00000421035  UTRN
chr6  145542907  145542992  ENST00000450221  EPM2A
chr6  146638398  146638645  ENST00000493950  ADGB
chr6  146871516  146871600  ENST00000606831  STXB5-AS1
chr6  148853707  148853761  ENST00000367463  UST
chr6  150505614  150505992  ENST00000407887  RP11-291C6.1
chr6  150881053  150881164  ENST00000423867  MTHFD1L
chr6  151531589  151531813  ENST00000239374  CCDC170
chr6  151606052  151606417  ENST00000537358  CCDC170
chr6  151921557  151922007  ENST00000415488  ESR1
chr6  152400313  152400541  ENST00000535081  SYNE1
chr6  152816744  152816923  ENST00000456715  RP1-200K18.1
chr6  153276067  153276276  ENST00000392385  RP11-306O13.1
chr6  153305434  153305648  ENST00000436953  RP11-475C16.2
chr6  154061507  154061912  ENST00000337049  OPRM1
chr6  155407886  155408048  ENST00000159060  NOX3
chr6  156915555  156915707  ENST00000319584  ARID1B
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chr6  157293848  157293950  ENST00000407887  TMEM242
chr6  157435721  157435960  ENST00000415488  ZDHHC14
| Chr | Start   | End     | Symbol | Description |
|-----|---------|---------|--------|-------------|
| chr6 | 157639224 | 157639433 | ENST00000422910 | ZDHHC14 |
| chr6 | 158016054 | 158016444 | ENST00000449320 | SYNJ2 |
| chr6 | 158036302 | 158036671 | ENST00000485863 | SYNJ2 |
| chr6 | 158058741 | 158058869 | ENST00000485863 | SYNJ2 |
| chr6 | 158227974 | 158228138 | ENST00000620026 | TULP4 |
| chr6 | 158236795 | 158236882 | ENST00000620026 | TULP4 |
| chr6 | 158477602 | 158478153 | ENST00000613390 | TULP4 |
| chr6 | 159025566 | 159025801 | ENST00000606470 | RP1-111C20.4 |
| chr6 | 160173162 | 16017427 | ENST00000486916 | SLC22A2 |
| chr6 | 161192102 | 161192469 | ENST00000366905 | AGPAT4 |
| chr6 | 161192102 | 161192469 | ENST00000366905 | AGPAT4 |
| chr6 | 161192102 | 161192469 | ENST00000366905 | AGPAT4 |
| chr6 | 161192102 | 161192469 | ENST00000366905 | AGPAT4 |
| chr6 | 161645990 | 161646099 | ENST00000366898 | PARK2 |
| chr6 | 162069228 | 162069278 | ENST00000366898 | PARK2 |
| chr6 | 162839493 | 162839545 | ENST00000534958 | PACRG |
| chr6 | 163557175 | 163557643 | ENST00000544361 | QKI |
| chr6 | 165399493 | 165399750 | ENST00000366882 | PDE10A |
| chr6 | 165409005 | 165409620 | ENST00000366882 | PDE10A |
| chr6 | 165859861 | 165860182 | ENST00000535229 | PDE10A |
| chr6 | 166529322 | 166529484 | ENST00000265678 | RPS6KA2 |
| chr6 | 16668094 | 166682164 | ENST00000265678 | RPS6KA2 |
| chr6 | 166880855 | 166881033 | ENST00000507747 | RP11-514O12.4 |
| chr6 | 166930357 | 166930453 | ENST00000507747 | RP11-514O12.4 |
| chr6 | 166930357 | 166930453 | ENST00000507747 | RP11-514O12.4 |
| chr6 | 168808316 | 16808794 | ENST00000443060 | KIF25 |
| chr6 | 168262416 | 168262466 | ENST00000446811 | RP11-503C24.4 |
| chr6 | 168614547 | 168614636 | ENST00000356284 | SMOC2 |
| chr6 | 169218180 | 169219242 | ENST00000444188 | XXyac-YX65C7_A.2 |
| chr6 | 169218180 | 169219242 | ENST00000444188 | XXyac-YX65C7_A.2 |
| chr6 | 169247579 | 169248080 | ENST00000472733 | THBS2 |
| chr6 | 169247579 | 169248080 | ENST00000472733 | THBS2 |
| chr6 | 169247579 | 169248080 | ENST00000472733 | THBS2 |
| chr6 | 169247579 | 169248080 | ENST00000472733 | THBS2 |
| chr6 | 169650428 | 169650851 | ENST00000448612 | WDR27 |
| chr6 | 169650428 | 169650851 | ENST00000448612 | WDR27 |
| chr6 | 169658637 | 169658846 | ENST00000448612 | WDR27 |
| Chromosome | Start | End | Ensembl ID | Gene | Description |
|------------|-------|-----|------------|------|-------------|
| chr5       | 148551| 148625| ENST00000362670 | Y_RNA | |
| chr5       | 345144| 345530| ENST00000504625 | AHRR | |
| chr5       | 345144| 345530| ENST00000504625 | AHRR | |
| chr5       | 426213| 427144| ENST00000511487 | AHRR | |
| chr5       | 856136| 856885| ENST00000493082 | BRD9 | |
| chr5       | 2707580| 2707741| ENST00000626215 | LSINCT5 | |
| chr5       | 3721566| 3721688| ENST00000408268 | AC091947.1 | |
| chr5       | 6802465| 6802690| ENST00000508881 | RP11-332J15.1 | |
| chr5       | 6929419| 6930228| ENST00000512838 | RP11-122F24.1 | |
| chr5       | 7722775| 7723188| ENST00000514105 | RP11-711G10.1 | |
| chr5       | 8788732| 8789090| ENST00000569381 | RP11-315A16.1 | |
| chr5       | 9353157| 9353323| ENST00000513968 | SEMA5A | |
| chr5       | 9353157| 9353323| ENST00000513968 | SEMA5A | |
| chr5       | 9353157| 9353323| ENST00000513968 | SEMA5A | |
| chr5       | 10737097| 10737241| ENST00000230895 | DAP | |
| chr5       | 11112977| 11113214| ENST00000304623 | CTNND2 | |
| chr5       | 11207083| 11207253| ENST00000304623 | CTNND2 | |
| chr5       | 11244421| 11244488| ENST00000304623 | CTNND2 | |
| chr5       | 11244421| 11244488| ENST00000304623 | CTNND2 | |
| chr5       | 11316678| 11317124| ENST00000304623 | CTNND2 | |
| chr5       | 11316678| 11317124| ENST00000304623 | CTNND2 | |
| chr5       | 11752699| 11752806| ENST00000504499 | CTNND2 | |
| chr5       | 12576579| 12577333| ENST00000505196 | LINC01194 | |
| chr5       | 12969376| 12969427| ENST00000510065 | RP11-419C19.2 | |
| chr5       | 13761267| 13761433| ENST00000265104 | DNAH5 | |
| chr5       | 13810860| 13811181| ENST00000512443 | DNAH5 | |
| chr5       | 14310612| 14310803| ENST00000515144 | TRIO | |
| chr5       | 14310612| 14310803| ENST00000515144 | TRIO | |
| chr5       | 15379178| 15379412| ENST00000507649 | MARK2P5 | |
| chr5       | 16592504| 16593122| ENST00000306320 | FAM134B | |
| chr5       | 17206598| 17206782| ENST00000399760 | AC091878.1 | |
| chr5       | 19550829| 19550922| ENST00000382275 | CDH18 | |
| chr5       | 19836987| 19837284| ENST00000382275 | CDH18 | |
| chr5       | 20431209| 20431609| ENST00000507632 | CDH18 | |
| chr5       | 20744639| 20744749| ENST00000512688 | RP11-774D14.1 | |
| chr5       | 21368115| 21368395| ENST00000508260 | GUSBP1 | |
| chr5       | 21849906| 21850201| ENST00000504376 | CDH12 | |
| chr5       | 25170368| 25170418| ENST00000507600 | RP11-549K20.1 | |
| Chr  | Start  | Stop   | Ensembl     | Gene       | Description          |
|------|--------|--------|-------------|------------|----------------------|
| chr5 | 25289963 | 25290304 | ENST00000502100 | RP11-184E9.1 |                     |
| chr5 | 25409479 | 25409920 | ENST00000511029 | CTD-2306M5.1 |                     |
| chr5 | 31110839 | 3111227 | ENST00000523584 | RP11-152K4.2 |                     |
| chr5 | 31200434 | 31200822 | ENST00000506396 | CDH6       |                     |
| chr5 | 31200434 | 31200822 | ENST00000506396 | CDH6       |                     |
| chr5 | 31450546 | 31450722 | ENST00000511367 | DROSHA     |                     |
| chr5 | 31709166 | 31709216 | ENST00000502824 | PDZD2      |                     |
| chr5 | 31829934 | 31830165 | ENST00000516078 | RNU6-760P  |                     |
| chr5 | 32228173 | 32228233 | ENST00000280285 | MTMR12     |                     |
| chr5 | 33029666 | 33029780 | ENST00000510327 | CTD-2066L21.3 |                 |
| chr5 | 33552807 | 33553738 | ENST00000504830 | ADAMT512   |                     |
| chr5 | 34021680 | 34021834 | ENST00000382065 | C1QTNF3    |                     |
| chr5 | 34030674 | 34030998 | ENST00000513065 | C1QTNF3    |                     |
| chr5 | 34182834 | 34182931 | ENST00000514048 | RP11-1023L17.1 |                |
| chr5 | 35139251 | 35139383 | ENST00000504500 | PRLR       |                     |
| chr5 | 35918162 | 35918544 | ENST00000397367 | CAPSL      |                     |
| chr5 | 36205952 | 36206164 | ENST00000397338 | NADK2      |                     |
| chr5 | 37059151 | 37059341 | ENST00000513819 | NIPBL      |                     |
| chr5 | 38516524 | 38517063 | ENST00000263409 | LIFR       |                     |
| chr5 | 41332720 | 41332987 | ENST00000377801 | PLCXD3     |                     |
| chr5 | 41446189 | 41446257 | ENST00000377801 | PLCXD3     |                     |
| chr5 | 42458857 | 42459641 | ENST00000513671 | GHR        |                     |
| chr5 | 42761440 | 42761490 | ENST00000388827 | CCDC152    |                     |
| chr5 | 44325664 | 44325751 | ENST00000264664 | FGF10      |                     |
| chr5 | 45333141 | 45333233 | ENST00000303230 | HCN1       |                     |
| chr5 | 45523417 | 45523618 | ENST00000303230 | HCN1       |                     |
| chr5 | 45549757 | 45550526 | ENST00000303230 | HCN1       |                     |
| chr5 | 45575340 | 45575500 | ENST00000303230 | HCN1       |                     |
| chr5 | 50440148 | 50440383 | ENST00000506190 | EMB        |                     |
| chr5 | 50812156 | 50812853 | ENST00000503750 | PARP8      |                     |
| chr5 | 51066003 | 51066077 | ENST00000411013 | AC091866.1 |                     |
| chr5 | 52030050 | 52030256 | ENST00000510583 | CTD-2203A3.1 |                 |
| chr5 | 54356051 | 54356491 | ENST00000517934 | LINC01033  |                     |
| chr5 | 60137647 | 60137823 | ENST00000509368 | PDE4D      |                     |
| chr5 | 60760302 | 60760747 | ENST00000508821 | ELOVL7     |                     |
| chr5 | 60977635 | 60977743 | ENST00000502658 | NDUF2      |                     |
| chr5 | 64194668 | 64194789 | ENST00000504296 | RNF180     |                     |
| chr5 | 65455414 | 65455547 | ENST00000470597 | ADAMT56    |                     |
| chr5 | 65693130 | 65693282 | ENST00000381007 | SGTB       |                     |
| chr5 | 67871324 | 67871529 | ENST00000510621 | RP11-83M16.6 |                 |
| chr5 | 68888201 | 68888521 | ENST00000503288 | CTC-3407D.1 |                     |
| chr5 | 70230172 | 70230347 | ENST00000514522 | RP11-1415C14.3 |                |
| chr5 | 70784959 | 70785168 | ENST00000505516 | RP11-589F5.4 |                     |
| Chr | Start      | End       | Ensembl | Gene     |
|-----|------------|-----------|---------|----------|
| chr5| 72628028   | 72628226  | ENST00000512573 | CTC-347C20.2 |
| chr5| 74106233   | 74106660  | ENST00000511395 | CTD-2292M14.1 |
| chr5| 74793503   | 74793670  | ENST00000514215 | FAM169A |
| chr5| 75357617   | 75357928  | ENST00000509085 | HMGR |
| chr5| 76898291   | 76898341  | ENST00000613039 | S100Z |
| chr5| 78792097   | 78792273  | ENST00000264914 | ARSB |
| chr5| 80947233   | 80947302  | ENST00000505694 | RASGRF2-AS1 |
| chr5| 83054615   | 83054752  | ENST00000502346 | TMEM167A |
| chr5| 84100538   | 84100630  | ENST00000296591 | EDIL3 |
| chr5| 86304281   | 86304399  | ENST00000624021 | CTD-2123J17.2 |
| chr5| 94718683   | 94719738  | ENST00000493934 | SLF1 |
| chr5| 95539549   | 95539748  | ENST00000505578 | TTC37 |
| chr5| 95653697   | 95653787  | ENST00000477715 | SPATA9 |
| chr5| 95753126   | 95753193  | ENST00000502541 | RHOBTB3 |
| chr5| 96395407   | 96395617  | ENST00000311106 | PCSK1 |
| chr5| 98830085   | 98830985  | ENST00000504105 | CSNK1A1P3 |
| chr5| 103460747  | 103461064 | ENST00000620846 | PDZP1H |
| chr5| 108774885  | 108775122 | ENST00000502752 | FER |
| chr5| 11191955   | 111919780 | ENST00000507222 | NREP-AS1 |
| chr5| 113459070  | 113459258 | ENST00000511242 | MCC |
| chr5| 124917054  | 124917253 | ENST00000509456 | RP11-284A20.1 |
| chr5| 127397936  | 127398113 | ENST00000274473 | MEGF10 |
| chr5| 127989581  | 127989675 | ENST00000499346 | LINC01184 |
| chr5| 129625431  | 129625678 | ENST00000503616 | CTC-557N7.1 |
| chr5| 129732272  | 129732558 | ENST00000503616 | CTC-557N7.1 |
| chr5| 134518972  | 134519168 | ENST00000464317 | RN7SL541P |
| chr5| 135171659  | 135172015 | ENST00000513931 | C5orf66 |
| chr5| 135614317  | 135614400 | ENST00000514446 | CTC-321K16.1 |
| chr5| 137813713  | 137813996 | ENST00000514616 | RP11-381K20.2 |
| chr5| 137826774  | 137826886 | ENST00000514616 | RP11-381K20.2 |
| chr5| 137843139  | 137843439 | ENST00000514616 | RP11-381K20.2 |
| chr5| 138699483  | 138699682 | ENST00000524127 | CTNA1 |
| chr5| 139452319  | 139452606 | ENST00000618155 | ECSCR |
| chr5| 140403344  | 140403431 | ENST00000394722 | ANKHD1 |
| chr5| 140532198  | 140532494 | ENST00000475148 | ANKHD1 |
| chr5| 141896609  | 141896696 | ENST00000515639 | AC005740.3 |
| chr5| 142986364  | 142986648 | ENST00000469396 | ARHGAP26 |
| chr5| 143423781  | 143424042 | ENST00000505058 | NR3C1 |
| chr5| 143622514  | 143622564 | ENST0000053323 | CTB-57H20.1 |
| chr5| 144245738  | 144245803 | ENST00000507359 | KCTD16 |
| chr5| 145798581  | 145798890 | ENST00000334744 | PRELID2 |
| chr5| 147429994  | 147430330 | ENST00000519672 | DPYSL3 |
| chr5| 148318267  | 148318813 | ENST00000511717 | SPINK9 |
| Chromosome | Start Position | End Position | Ensembl Transcript ID | Description |
|------------|----------------|--------------|----------------------|-------------|
| chr5       | 149395151      | 149395227    | ENST00000505432      | IL17B       |
| chr5       | 150096945      | 150097358    | ENST00000335244      | Y_RNA       |
| chr5       | 151334413      | 151334607    | ENST00000522300      | LINC01470   |
| chr5       | 152706000      | 152706800    | ENST00000522300      | LINC01470   |
| chr5       | 15273514       | 152774771    | ENST00000522300      | LINC01470   |
| chr5       | 158525004      | 158525137    | ENST00000519609      | RP11-32D16.1|
| chr5       | 164510782      | 164511018    | ENST00000522762      | CTC-340A15.2|
| chr5       | 168406686      | 168406906    | ENST00000524228      | WWC1        |
| chr5       | 169645357      | 169645542    | ENST00000524185      | DOCK2       |
| chr5       | 170227970      | 170228197    | ENST00000521850      | C5orf58     |
| chr5       | 170291002      | 170291205    | ENST00000519594      | LCP2        |
| chr5       | 170291002      | 170291205    | ENST00000519594      | LCP2        |
| chr5       | 170964864      | 170965490    | ENST00000521165      | RANBP17     |
| chr5       | 171915798      | 171916141    | ENST00000296933      | FBXW11      |
| chr5       | 172416316      | 172416452    | ENST00000311601      | SH3PXD2B    |
| chr5       | 176872585      | 176873069    | ENST00000509580      | UNCSA       |
| chr5       | 176885509      | 176885605    | ENST00000506834      | HK3         |
| chr5       | 177816727      | 177816815    | ENST00000506082      | RP11-423H2.1|
| chr5       | 178007126      | 178007350    | ENST00000508839      | FAM153C     |
| chr5       | 178035555      | 178035881    | ENST00000511189      | FAM153C     |
| chr5       | 178261231      | 178261296    | ENST00000390654      | COL23A1     |
| chr5       | 178945193      | 178945552    | ENST00000522827      | ZNF454      |
| chr5       | 179328147      | 179328335    | ENST00000521582      | ADAMTS2     |
| chr4       | 7976896        | 7977130      | ENST00000512594      | ABLIM2      |
| chr4       | 37495261       | 37495393     | ENST00000508175      | C4orf19     |
| chr4       | 41216403       | 41216457     | ENST00000502682      | APBB2       |
| chr4       | 47094436       | 47094734     | ENST00000510909      | GABRB1      |
| chr4       | 49202134       | 49202244     | ENST00000512142      | RP11-1281K21.2|
| chr4       | 49206440       | 49207223     | ENST00000580661      | AC118282.4  |
| chr4       | 49555052       | 49555777     | ENST00000513357      | RP11-241F15.7|
| chr4       | 57458885       | 57459084     | ENST00000510956      | RP11-319E12.1|
| chr4       | 70918388       | 70918630     | ENST00000511449      | MOB1B       |
| chr4       | 75416502       | 75417215     | ENST00000515230      | RP11-567N4.3|
| chr4       | 78796356       | 78796425     | ENST00000502871      | BMP2K       |
| chr4       | 90324345       | 90324525     | ENST00000508086      | CCSER1      |
| chr4       | 95192604       | 95192796     | ENST00000610318      | UNC5C       |
| chr4       | 95192604       | 95192796     | ENST00000610318      | UNC5C       |
| chr4       | 95229998       | 95230322     | ENST00000610318      | UNC5C       |
| chr4       | 97362327       | 97362451     | ENST00000522676      | STPG2       |
| chr4       | 101559101      | 101559227    | ENST00000504592      | BANK1       |
| chr4       | 103170057      | 103170192    | ENST00000503705      | CENPE       |
| chr4       | 105390635      | 105391281    | ENST00000341695      | PPA2        |
| Chr | Start | End   | Gene          | GeneSymbol | Reference       |
|-----|-------|-------|---------------|------------|-----------------|
| chr4 | 111950276 | 111950475 | ENST00000511219 | RP11-269F21.3 |
| chr4 | 141060915 | 141061064 | ENST00000515673 | RNF150      |
| chr4 | 142677522 | 142677863 | ENST00000514964 | INPP4B      |
| chr4 | 144865469 | 144865591 | ENST00000512833 | RP13-539F13.3|
| chr4 | 152664136 | 152664443 | ENST00000504064 | TMEM154      |
| chr4 | 161515269 | 161516164 | ENST00000306100 | FSTL5       |
| chr4 | 164077474 | 164078441 | ENST00000503104 | 1-Mar        |
| chr4 | 167982817 | 167982908 | ENST00000506926 | RP11-310I9.1 |
| chr4 | 169496291 | 169496369 | ENST00000439128 | NEK1        |
| chr4 | 170597258 | 170598080 | ENST00000325407 | HSP90AA6P   |
| chr4 | 186556724 | 186556774 | ENST00000307161 | MTRN1A      |
| chr4 | 188208298 | 188208348 | ENST00000630825 | AC138781.1  |
| chr4 | 190021659 | 190022767 | ENST00000449051 | DUX4L9      |
| chr4 | 190067614 | 190067810 | ENST00000629013 | DUX4L8      |
| chr4 | 190071401 | 190071562 | ENST00000630678 | DUX4L7      |
| chr3 | 2585536  | 2585746 | ENST00000427331 | CNTN4       |
| chr3 | 3384463  | 3384597 | ENST00000420000 | AC026188.1  |
| chr3 | 3442077  | 3442238 | ENST00000420000 | AC026188.1  |
| chr3 | 6025749  | 6026160 | ENST00000425894 | AC027119.1  |
| chr3 | 6875475  | 6875529 | ENST00000435689 | GRM7        |
| chr3 | 6888360  | 6888441 | ENST00000435689 | GRM7        |
| chr3 | 9735957  | 9736346 | ENST00000457855 | BRPF1       |
| chr3 | 10365475 | 10365853 | ENST00000352432 | ATP2B2      |
| chr3 | 10365475 | 10365853 | ENST00000352432 | ATP2B2      |
| chr3 | 10365475 | 10365853 | ENST00000352432 | ATP2B2      |
| chr3 | 10473509 | 10473559 | ENST00000480680 | ATP2B2      |
| chr3 | 11303813 | 11303958 | ENST00000488924 | ATG7        |
| chr3 | 12387527 | 12387841 | ENST00000396999 | PPARG       |
| chr3 | 12749979 | 12750145 | ENST00000314124 | TMEM40      |
| chr3 | 13649673 | 13649879 | ENST00000438915 | LINC00620   |
| chr3 | 13868308 | 13869281 | ENST00000285018 | WNT7A       |
| chr3 | 13868308 | 13869281 | ENST00000285018 | WNT7A       |
| chr3 | 13868308 | 13869281 | ENST00000285018 | WNT7A       |
| chr3 | 15731842 | 15731899 | ENST00000476472 | ANKRD28     |
| chr3 | 15792149 | 15792666 | ENST00000461696 | ANKRD28     |
| chr3 | 16194572 | 16194856 | ENST00000430410 | GALNT15     |
| chr3 | 16688424 | 16688565 | ENST00000426218 | AC091493.2  |
| chr3 | 17634240 | 17634488 | ENST00000253692 | TBC1D5      |
| chr3 | 17650078 | 17650278 | ENST00000253692 | TBC1D5      |
| chr3 | 18690698 | 18690799 | ENST00000425799 | SATB1-AS1   |
| chr3 | 23873566 | 23873756 | ENST00000493707 | UBE2E1      |
| chr3 | 24421029 | 24421245 | ENST00000396671 | THRBD       |
| chr3 | 25644571 | 25644770 | ENST00000264331 | TOP2B       |
| Chromosome | Start Position | End Position | Transcript ID | Gene Name      |
|------------|----------------|--------------|---------------|----------------|
| chr3       | 52748913       | 52749116     | ENST00000383721 | NEK4           |
| chr3       | 73443467       | 73443523     | ENST00000498048 | PDZRN3         |
| chr3       | 75669190       | 75669633     | ENST00000489078 | DUX4L26        |
| chr3       | 75669190       | 75669633     | ENST00000489078 | DUX4L26        |
| chr3       | 100433679      | 100433788    | ENST00000489752 | LNP1           |
| chr3       | 133430259      | 133430473    | ENST00000515542 | BFSP2-AS1      |
| chr3       | 133430259      | 133430473    | ENST00000515542 | BFSP2-AS1      |
| chr3       | 142661919      | 142662498    | ENST00000497002 | PLS1           |
| chr3       | 148306918      | 148307087    | ENST00000469812 | RP11-501O2.5   |
| chr3       | 152249279      | 152249590    | ENST00000477171 | MBNL1          |
| chr3       | 158612151      | 158612528    | ENST00000489154 | MTAPP1         |
| chr3       | 161186675      | 161186937    | ENST00000460503 | NMD3           |
| chr3       | 185259585      | 185259775    | ENST00000465178 | EHHADH         |
| chr3       | 197459678      | 197459886    | ENST00000420213 | AC128709.2     |
| chr3       | 197459678      | 197459886    | ENST00000420213 | AC128709.2     |
| chr3       | 197459678      | 197459886    | ENST00000420213 | AC128709.2     |
| chr2       | 1154883        | 1155028      | ENST00000463442 | SNTG2          |
| chr2       | 1725583        | 1725798      | ENST00000425171 | PXDN           |
| chr2       | 1725583        | 1725798      | ENST00000425171 | PXDN           |
| chr2       | 2257784        | 2258118      | ENST00000428368 | MYT1L          |
| chr2       | 3295723        | 3296634      | ENST00000478754 | TSSC1          |
| chr2       | 3295723        | 3296634      | ENST00000478754 | TSSC1          |
| chr2       | 3295723        | 3296634      | ENST00000478754 | TSSC1          |
| chr2       | 3315953        | 3316003      | ENST00000478754 | TSSC1          |
| chr2       | 3315953        | 3316003      | ENST00000478754 | TSSC1          |
| chr2       | 3971233        | 3972238      | ENST00000425949 | LINC01304      |
| chr2       | 6759674        | 6760418      | ENST00000382045 | LINC00487      |
| chr2       | 8668005        | 8668584      | ENST00000412712 | ID2-AS1        |
| chr2       | 11666721       | 11666847     | ENST00000306928 | NTSR2          |
| chr2       | 14247484       | 14248623     | ENST00000418420 | LINC00276      |
| chr2       | 19180859       | 19181010     | ENST00000432142 | LINC01376      |
| chr2       | 20559511       | 20559734     | ENST00000446825 | HS1BP3         |
| chr2       | 23045869       | 23046280     | ENST00000421581 | AC016768.1     |
| chr2       | 25752580       | 25752742     | ENST00000435504 | ASXL2          |
| chr2       | 28018809       | 28019506     | ENST00000603137 | RP11-67416.2   |
| chr2       | 31075098       | 31075148     | ENST00000430167 | GALNT14        |
| chr2       | 31965046       | 31965333     | ENST00000295065 | MEMO1          |
| chr2       | 31965046       | 31965333     | ENST00000295065 | MEMO1          |
| chr2       | 31996117       | 31996336     | ENST00000295065 | MEMO1          |
| chr2       | 32013835       | 32014118     | ENST00000605811 | CTC-336P14.1   |
| chr2       | 32916217       | 32916626     | ENST00000435075 | LINC00486      |
| chr2       | 32916217       | 32916626     | ENST00000435075 | LINC00486      |
| chr2       | 32916217       | 32916626     | ENST00000435075 | LINC00486      |
| Chromosome | Start Position | End Position | Gene Identifier | Gene Symbol |
|------------|----------------|--------------|----------------|-------------|
| chr2       | 34934299       | 34934352     | ENST00000626243 | AC012593.1  |
| chr2       | 34948995       | 34949259     | ENST00000626243 | AC012593.1  |
| chr2       | 36720644       | 36721056     | ENST00000401530 | VIT         |
| chr2       | 37692132       | 37692259     | ENST00000494083 | CDC42EP3    |
| chr2       | 38063035       | 38063250     | ENST00000601029 | RMDN2-AS1   |
| chr2       | 43238071       | 43238144     | ENST00000405975 | THADA       |
| chr2       | 43533640       | 43533814     | ENST00000462185 | THADA       |
| chr2       | 43687463       | 43687732     | ENST00000460356 | PLEKHH2     |
| chr2       | 46604628       | 46604818     | ENST00000281382 | PIGF        |
| chr2       | 48041834       | 48041906     | ENST00000447571 | AC079807.4  |
| chr2       | 48918208       | 48919651     | ENST00000454986 | CTBP2P5     |
| chr2       | 50274056       | 50274459     | ENST00000401710 | NRXN1       |
| chr2       | 51120406       | 51120520     | ENST00000440698 | AC007682.1  |
| chr2       | 51183317       | 51183544     | ENST00000440698 | AC007682.1  |
| chr2       | 52907676       | 52908215     | ENST00000421575 | AC010967.2  |
| chr2       | 53489042       | 53489275     | ENST00000421749 | AC069157.1  |
| chr2       | 54563723       | 54563816     | ENST00000333896 | SPTBN1      |
| chr2       | 57979468       | 57979676     | ENST00000463222 | VRK2        |
| chr2       | 62951516       | 62951566     | ENST00000454124 | EHBP1       |
| chr2       | 63229767       | 63230018     | ENST00000409354 | WDPCP       |
| chr2       | 63626708       | 63626848     | ENST00000436998 | AC016734.2  |
| chr2       | 63857189       | 63857452     | ENST00000495020 | UGP2        |
| chr2       | 66546111       | 66546286     | ENST00000450027 | MEIS1       |
| chr2       | 67262265       | 67262325     | ENST00000630617 | AC023115.2  |
| chr2       | 67262265       | 67262325     | ENST00000630617 | AC023115.2  |
| chr2       | 67262265       | 67262325     | ENST00000630617 | AC023115.2  |
| chr2       | 69490563       | 69490816     | ENST00000606389 | AAK1        |
| chr2       | 69793075       | 69793126     | ENST00000484219 | ANXA4       |
| chr2       | 71577380       | 71577513     | ENST00000479049 | DYSF        |
| chr2       | 72420665       | 72420765     | ENST00000464347 | EXOC6B      |
| chr2       | 74563560       | 74563684     | ENST00000290536 | M1AP        |
| chr2       | 75470513       | 75470569     | ENST00000490746 | EVA1A       |
| chr2       | 79692623       | 79692914     | ENST00000402739 | CTNNA2      |
| chr2       | 79745515       | 79745629     | ENST00000508970 | CTNNA2      |
| chr2       | 80538033       | 80538831     | ENST00000465616 | CTNNA2      |
| chr2       | 88901794       | 88902006     | ENST00000430694 | IGKC        |
| chr2       | 91577491       | 91577541     | ENST00000454518 | AC018696.4  |
| chr2       | 94978643       | 94979305     | ENST00000432787 | AC103563.6  |
| chr2       | 95946656       | 95947023     | ENST00000528268 | ANKRD36C    |
| chr2       | 96790517       | 96790997     | ENST00000493384 | CNNM4       |
| chr2       | 99603998       | 99604551     | ENST00000409236 | AFF3        |
| chr2       | 100210817      | 100210979    | ENST00000452354 | LINC01104   |
| chr2       | 104529855      | 104530517    | ENST00000362857 | U3          |
chr2  107914008  107914058  ENST00000448535  AC009963.5
chr2  112625157  112625259  ENST00000443291  AC079922.2
chr2  117763156  117763156  ENST00000457110  AC009312.1
chr2  121088255  121088255  ENST00000441053  AC067960.1
chr2  121259264  121259264  ENST00000263707  TFCP2L1
chr2  130554614  1305549259  ENST00000409261  NCKAP5
chr2  132286258  132286714  ENST00000440802  AC097532.2
chr2  132878547  132878670  ENST00000409261  NCKAP5
chr2  133374477  133374652  ENST00000409261  NCKAP5
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chr2  136936479  136936717  ENST00000272643  THSD7B
chr2  137164791  137164916  ENST00000449117  ARHGAP15
chr2  140218939  140219614  ENST00000495849  THSD7B
chr2  140303380  140303531  ENST00000389484  LRP1B
chr2  140319531  140319766  ENST00000389484  LRP1B
chr2  141203453  141203578  ENST00000389484  LRP1B
chr2  143303116  143304575  ENST00000389484  LRP1B
chr2  148640406  148640607  ENST00000451784  EPC2
chr2  165156501  165156559  ENST00000440311  SCN3A
chr2  167374442  167374870  ENST00000442316  AC074363.1
chr2  168124783  168125023  ENST00000355999  STK39
chr2  169251270  169251913  ENST00000448381  LRP2
chr2  170280109  170280286  ENST00000460262  MYO3B
chr2  172527815  172528849  ENST00000450443  AC093818.1
chr2  174676962  174677034  ENST00000469002  WIF1
chr2  179774066  179774499  ENST00000451732  ZNF385B
chr2  186073713  186074428  ENST00000456653  LINC01473
chr2  186625830  186626030  ENST00000451906  RPL23AP35
chr2  188567346  188567672  ENST00000495745  GULP1
chr2  188743576  188743934  ENST00000431708  AC079613.1
chr2  19041344  190413938  ENST00000432036  MFS6
chr2  191095516  191095821  ENST00000495849  STAT4
chr2  191809592  191810001  ENST00000413304  AC098872.3
chr2  196867381  196867530  ENST00000354764  PGAP1
chr2  197128197  197128345  ENST00000409919  ANKR4D4
chr2  197594291  197594462  ENST00000295049  RFTN2
chr2  197860327  197860806  ENST00000487695  PLCL1
chr2  197905974  197906578  ENST00000487695  PLCL1
chr2  201555236  201555397  ENST00000286195  ALS2CR11
chr2  204992104  204992190  ENST00000614500  PARD3B
chr2  206759404  206759627  ENST00000374412  MDH1B
chr2  209950839  209951041  ENST00000481494  UNC80
chr2  211579612  211579889  ENST00000402597  ERBB4
| Chromosome | Start Position | End Position | Gene ID | Gene Name |
|------------|----------------|--------------|---------|-----------|
| chr2       | 215009017      | 215009328    | ENST00000272895 | ABCA12    |
| chr2       | 222883346      | 222883461    | ENST00000413316 | ACSL3     |
| chr2       | 223756185      | 223756430    | ENST00000443700 | API1S3    |
| chr2       | 224840758      | 224841146    | ENST00000472652 | DOCK10    |
| chr2       | 228909377      | 228909500    | ENST00000482518 | PID1      |
| chr2       | 229500161      | 229500306    | ENST00000341772 | DNER      |
| chr2       | 230054791      | 230054880    | ENST00000295190 | SLC16A14  |
| chr2       | 231126258      | 231126375    | ENST00000258400 | HTR2B     |
| chr2       | 233581215      | 233581314    | ENST00000447084 | UGT1A12P  |
| chr2       | 233622393      | 233622728    | ENST00000373450 | UGT1A8    |
| chr2       | 233754390      | 237544515    | ENST00000434770 | MPI       |
| chr2       | 238871118      | 238871214    | ENST00000612363 | TWIST2    |
| chr2       | 240239264      | 240239585    | ENST00000457178 | AC124861.1|
| chr2       | 240527559      | 240527744    | ENST00000373318 | ANKMY1    |
| chr2       | 240527559      | 240527744    | ENST00000373318 | ANKMY1    |
| chr2       | 240625693      | 240626387    | ENST00000407714 | GPR35     |
| chr2       | 240625693      | 240626387    | ENST00000407714 | GPR35     |
| chr2       | 240625693      | 240626387    | ENST00000407714 | GPR35     |
| chr2       | 240625693      | 240626387    | ENST00000407714 | GPR35     |
| chr2       | 240625693      | 240626387    | ENST00000407714 | GPR35     |
| chr2       | 240625693      | 240626387    | ENST00000407714 | GPR35     |
| chr2       | 240625693      | 240626387    | ENST00000407714 | GPR35     |
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| chr1       | 40714          | 40791        | ENST00000461467 | FAM138A   |
| chr1       | 40714          | 40791        | ENST00000461467 | FAM138A   |
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| chr1       | 40714          | 40791        | ENST00000461467 | FAM138A   |
| chr1       | 40714          | 40791        | ENST00000461467 | FAM138A   |
| chr1       | 40714          | 40791        | ENST00000461467 | FAM138A   |
| chr1       | 40714          | 40791        | ENST00000461467 | FAM138A   |
| chr1       | 40714          | 40791        | ENST00000461467 | FAM138A   |
| chr1       | 40714          | 40791        | ENST00000461467 | FAM138A   |
| chr1       | 438405         | 438606       | ENST00000455207 | RPA4-669L17.10 |
| chr1       | 1132177        | 1132271      | ENST00000416774 | LINC01342 |
| chr1       | 1213404        | 1213511      | ENST00000379236 | TNRSF4    |
| chr1       | 1289870        | 1290134      | ENST00000379099 | SCNN1D    |
| chr1       | 1289870        | 1290134      | ENST00000379099 | SCNN1D    |
| chr1       | 1289870        | 1290134      | ENST00000379099 | SCNN1D    |
| chr1       | 1289870        | 1290134      | ENST00000379099 | SCNN1D    |
| chr1       | 1316378        | 1316486      | ENST00000482042 | CPSF3L    |
| Chromosome | Start | End   | Gene Name          | Transcript ID |
|------------|-------|-------|--------------------|---------------|
| chr1       | 2155462 | 2155873 | ENST00000478770 | PRKCZ         |
| chr1       | 2200059 | 2200131 | ENST00000487186 | FAAP20        |
| chr1       | 2200059 | 2200131 | ENST00000487186 | FAAP20        |
| chr1       | 3449464 | 3449524 | ENST00000378378 | ARHGEF16      |
| chr1       | 3449464 | 3449524 | ENST00000378378 | ARHGEF16      |
| chr1       | 3726418 | 3726850 | ENST00000604566 | TP73          |
| chr1       | 5490209 | 5490366 | ENST00000564261 | RP1-58B11.1   |
| chr1       | 6107114 | 6107305 | ENST00000262450 | CHD5          |
| chr1       | 6107114 | 6107305 | ENST00000262450 | CHD5          |
| chr1       | 6107803 | 6108358 | ENST00000262450 | CHD5          |
| chr1       | 6107803 | 6108358 | ENST00000262450 | CHD5          |
| chr1       | 6107803 | 6108358 | ENST00000262450 | CHD5          |
| chr1       | 6107803 | 6108358 | ENST00000262450 | CHD5          |
| chr1       | 6107803 | 6108358 | ENST00000262450 | CHD5          |
| chr1       | 6481279 | 6481395 | ENST00000535355 | PLEKHG5       |
| chr1       | 8321959 | 8322429 | ENST00000471889 | SLC45A1       |
| chr1       | 8321959 | 8322429 | ENST00000471889 | SLC45A1       |
| chr1       | 10111808 | 10111992 | ENST00000475795 | UBE4B         |
| chr1       | 11527392 | 11527494 | ENST00000294484 | PTCHD2        |
| chr1       | 11527392 | 11527494 | ENST00000294484 | PTCHD2        |
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| chr1       | 12066493 | 12066714 | ENST00000629987 | Metazoa_SRP  |
| chr1       | 12583489 | 12583849 | ENST00000616661 | DHR3          |
| chr1       | 12584885 | 12585338 | ENST00000616661 | DHR3          |
| chr1       | 12584885 | 12585338 | ENST00000616661 | DHR3          |
| chr1       | 15162629 | 15162950 | ENST00000376008 | TMEM51        |
| chr1       | 16132704 | 16132814 | ENST00000358432 | EPHA2         |
| chr1       | 16142816 | 16143276 | ENST00000480202 | EPHA2         |
| chr1       | 16142816 | 16143276 | ENST00000480202 | EPHA2         |
| chr1       | 16634795 | 16635005 | ENST00000362058 | CROCCP2       |
| chr1       | 18851474 | 18851537 | ENST00000375371 | TAS1R2        |
| chr1       | 18851474 | 18851537 | ENST00000375371 | TAS1R2        |
| chr1       | 18851474 | 18851537 | ENST00000375371 | TAS1R2        |
| chr1       | 18851474 | 18851537 | ENST00000375371 | TAS1R2        |
| chr1       | 20294737 | 20294850 | ENST00000473325 | VWASB1        |
| chr1       | 23245905 | 23246280 | ENST00000442089 | RPS5-1057J7.1 |
| chr1       | 24456997 | 24457110 | ENST00000432012 | NIPAL3        |
| chr1       | 25740876 | 25741094 | ENST00000374329 | MAN1C1        |
| chr1       | 26325443 | 26325613 | ENST00000527815 | AIM1L         |
| Chromosome | Start | End | Gene Symbol | Description |
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| chr1       | 27675212 | 27675262 | ENST00000625232 | RP11-288L9.4 |
| chr1       | 29100335 | 29100449 | ENST00000410852 | RN7SKP91 |
| chr1       | 30840061 | 30840319 | ENST00000491976 | SERINC2 |
| chr1       | 31431740 | 31432187 | ENST00000491976 | SERINC2 |
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| chr1       | 31431740 | 31432187 | ENST00000491976 | SERINC2 |
| chr1       | 31431740 | 31432187 | ENST00000491976 | SERINC2 |
| chr1       | 31431740 | 31432187 | ENST00000491976 | SERINC2 |
| chr1       | 33335793 | 33335973 | ENST00000627130 | RP11-415J8.3 |
| chr1       | 36120611 | 36121176 | ENST00000397799 | COL8A2 |
| chr1       | 37318729 | 37319369 | ENST00000372331 | CDC8 |
| chr1       | 39381347 | 39381406 | ENST00000289893 | MACF1 |
| chr1       | 40458552 | 40458762 | ENST00000361584 | ZFP69B |
| chr1       | 41229465 | 41229676 | ENST00000488592 | SCMH1 |
| chr1       | 41529025 | 41529357 | ENST00000372583 | HIVEP3 |
| chr1       | 41529025 | 41529357 | ENST00000372583 | HIVEP3 |
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| chr1       | 41529025 | 41529357 | ENST00000372583 | HIVEP3 |
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| chr1       | 41785831 | 41785915 | ENST00000372583 | HIVEP3 |
| chr1       | 47134734 | 47135400 | ENST00000444402 | CYP4A22-AS1 |
| chr1       | 49618804 | 49619583 | ENST00000497451 | AGBL4 |
| chr1       | 50437563 | 50437663 | ENST00000396153 | FAF1 |
| chr1       | 54622556 | 54622812 | ENST00000302250 | FAM151A |
| chr1       | 54622556 | 54622812 | ENST00000302250 | FAM151A |
| chr1       | 54881373 | 54882052 | ENST00000371269 | DHRCR24 |
| chr1       | 56748077 | 56748271 | ENST00000343433 | C1orf168 |
| chr1       | 58808225 | 58808275 | ENST00000419531 | LINC01135 |
| chr1       | 59347313 | 59347482 | ENST00000371212 | FGGY |
| chr1       | 59576077 | 59576582 | ENST00000371210 | FGGY |
| chr1       | 61801049 | 61801333 | ENST00000613764 | INADL |
| Chromosome | Start | End   | Transcript ID   | Genes                  |
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| chr1       | 63212743 | 63212891 | ENST00000455304 | LINC00466              |
| chr1       | 64740631 | 64741134 | ENST00000371072 | RAVER2                 |
| chr1       | 65005152 | 65005537 | ENST00000607528 | RP4-535B20.4           |
| chr1       | 65841134 | 65841274 | ENST0000031517  | PDE4B                  |
| chr1       | 66665009 | 66665191 | ENST00000502413 | RP4-598P13.1           |
| chr1       | 67526613 | 67526741 | ENST00000230113 | RP4-763G1.2            |
| chr1       | 67665797 | 67666098 | ENST00000426952 | HNRNPCP9               |
| chr1       | 68171565 | 68172057 | ENST00000497187 | WLS                    |
| chr1       | 71799880 | 71800518 | ENST00000434200 | NEGR1                  |
| chr1       | 73671312 | 73671589 | ENST00000424953 | RP4-788P17.1           |
| chr1       | 77699635 | 77700069 | ENST00000370794 | USP33                  |
| chr1       | 83991118 | 83991283 | ENST00000477524 | TTLL7                  |
| chr1       | 85238327 | 85324124 | ENST00000535924 | DDAH1                  |
| chr1       | 91975047 | 91975162 | ENST00000402388 | BRDT                   |
| chr1       | 92674393 | 92674565 | ENST00000540033 | EVI5                   |
| chr1       | 94331782 | 94332657 | ENST00000418242 | RP11-148B18.3          |
| chr1       | 94752340 | 94753069 | ENST00000442418 | LINC01057              |
| chr1       | 94777429 | 94777563 | ENST00000442418 | LINC01057              |
| chr1       | 95739103 | 95739417 | ENST00000603401 | RP11-286B14.2          |
| chr1       | 96720355 | 96720475 | ENST00000482253 | PTBP2                  |
| chr1       | 97705726 | 97705929 | ENST00000474241 | DPYD                   |
| chr1       | 99507331 | 99507529 | ENST00000438829 | RP11-413P11.1          |
| chr1       | 108133013 | 108133151 | ENST00000565488 | SLC25A24               |
| chr1       | 108429163 | 108430016 | ENST00000419814 | RP11-131J3.1           |
| chr1       | 109568345 | 109568421 | ENST00000369851 | GNAI3                  |
| chr1       | 110940718 | 110940929 | ENST00000562952 | RP11-96K19.4           |
| chr1       | 112520073 | 112520212 | ENST00000608357 | RP4-671G15.2           |
| chr1       | 113968768 | 113968864 | ENST00000361587 | HIPK1                  |
| chr1       | 116562470 | 116562631 | ENST00000369489 | CD58                   |
| chr1       | 145920772 | 145920772 | ENST00000361928 | GNRHR2                 |
| chr1       | 146842865 | 146843159 | ENST00000408633 | AC241929.1             |
| chr1       | 148522481 | 148522537 | ENST00000622285 | U1                     |
| chr1       | 161095246 | 161095296 | ENST00000490724 | KLHC9                  |
| chr1       | 161360468 | 161360961 | ENST00000470743 | SDHC                   |
| chr1       | 161539171 | 161539353 | ENST00000416185 | RPS23P10               |
| chr1       | 163115090 | 163115214 | ENST00000469495 | RGS5                   |
| chr1       | 164574780 | 164574847 | ENST00000559578 | PBX1                   |
| chr1       | 165639583 | 165639651 | ENST00000627653 | MGST3                  |
| chr1       | 166447702 | 166448178 | ENST00000448643 | RP11-479J7.1           |
| chr1       | 166972700 | 166972937 | ENST00000271417 | ILDR2                  |
| chr1       | 168480177 | 168480397 | ENST00000242253 | RP5-968D22.3           |
| chr1       | 168770051 | 168770526 | ENST00000457405 | RP1-10C16.1            |
| chr1       | 169302514 | 169302645 | ENST00000472647 | NME7                   |
| Chromosome | Start Base | End Base | Transcript ID | Gene Symbol |
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| chr1        | 174674773  | 174674855| ENST00000474375| RABGAP1L    |
| chr1        | 175325737  | 175325978| ENST00000569593| RP3-518E13.2|
| chr1        | 175557714  | 175558145| ENST00000455447| TNR-IT1     |
| chr1        | 177253368  | 177253553| ENST00000460161| BRINP2      |
| chr1        | 177510720  | 177510946| ENST00000438575| RP1-35C21.2 |
| chr1        | 181016860  | 181017120| ENST00000542060| STX6        |
| chr1        | 185429924  | 185430068| ENST00000516598| RNU7-183P   |
| chr1        | 185517640  | 185517845| ENST00000622958| GS1-204I12.3|
| chr1        | 185608751  | 185608850| ENST00000608417| LINCO1350   |
| chr1        | 186392319  | 186392646| ENST00000432021| C1orf27     |
| chr1        | 201670274  | 201670458| ENST00000367296| NAV1        |
| chr1        | 202513926  | 202514238| ENST00000466273| PPP1R12B    |
| chr1        | 203624121  | 203624403| ENST00000357681| ATP2B4      |
| chr1        | 204863773  | 204864017| ENST00000403080| NFASC       |
| chr1        | 205990735  | 205990946| ENST00000617070| RAB7B       |
| chr1        | 205990735  | 205990946| ENST00000617070| RAB7B       |
| chr1        | 207065490  | 207065574| ENST00000367079| PFKFB2      |
| chr1        | 210066198  | 210066810| ENST00000534859| SYT14       |
| chr1        | 212964998  | 212965002| ENST00000481097| VASH2       |
| chr1        | 214468255  | 214468581| ENST00000366956| PTPN14      |
| chr1        | 214490802  | 214490959| ENST00000366956| PTPN14      |
| chr1        | 215167922  | 215168784| ENST00000457122| KCNK2       |
| chr1        | 217565812  | 217565989| ENST00000470014| GPATCH2     |
| chr1        | 219769661  | 219769748| ENST00000484239| SLC30A10    |
| chr1        | 223108882  | 223109276| ENST00000540964| TLR5        |
| chr1        | 223335979  | 223336186| ENST00000344029| SUSD4       |
| chr1        | 223538356  | 223538566| ENST00000484873| CAPN8       |
| chr1        | 223757850  | 223758016| ENST00000474026| CAPN2       |
| chr1        | 223798795  | 223799109| ENST00000391878| TP53BP2     |
| chr1        | 225411891  | 225411996| ENST00000272163| LBR         |
| chr1        | 225510879  | 225511091| ENST00000366844| ENAH        |
| chr1        | 225780171  | 225780357| ENST00000366838| SRP9        |
| chr1        | 226405267  | 226405508| ENST00000366792| PARP1       |
| chr1        | 226956990  | 226957082| ENST00000489044| ADCK3       |
| chr1        | 226956990  | 226957082| ENST00000489044| ADCK3       |
| chr1        | 226956990  | 226957082| ENST00000489044| ADCK3       |
| chr1        | 226978862  | 226979039| ENST00000485462| ADCK3       |
| chr1        | 226978862  | 226979039| ENST00000485462| ADCK3       |
| chr1        | 226978862  | 226979039| ENST00000485462| ADCK3       |
| chr1        | 226978862  | 226979039| ENST00000485462| ADCK3       |
| chr1        | 226978862  | 226979039| ENST00000485462| ADCK3       |
| chr1        | 226978862  | 226979039| ENST00000485462| ADCK3       |
| chr1        | 226978862  | 226979039| ENST00000485462| ADCK3       |
| chr1        | 226978862  | 226979039| ENST00000485462| ADCK3       |
| chr1        | 226978862  | 226979039| ENST00000485462| ADCK3       |
| Chromosome | Start Position | End Position | Gene   |
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| chr1       | 227227978      | 227228141    | CDC42BPA |
| chr1       | 227433723      | 227433902    | BTF3P9  |
| chr1       | 228042349      | 228042951    | WNT3A   |
| chr1       | 228459986      | 228460208    | HIST3H2BB |
| chr1       | 228556434      | 228558318    | RNA5SP162 |
| chr1       | 228556434      | 228558318    | RNA5SP162 |
| chr1       | 228556434      | 228558318    | RNA5SP162 |
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| chr1       | 228556434      | 228558318    | RNA5SP162 |
| chr1       | 228556434      | 228558318    | RNA5SP162 |
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| chr1       | 228556434      | 228558318    | RNA5SP162 |
| chr1       | 228609867      | 228610082    | RNA5S1  |
| chr1       | 228611068      | 228611534    | RNA5S1  |
| chr1       | 228622224      | 228622677    | RNA5S6  |
| chr1       | 228624460      | 228624920    | RNA5S7  |
| chr1       | 228626710      | 228627126    | RNA5S8  |
| chr1       | 228637883      | 228638349    | RNA5S13 |
| chr1       | 228640118      | 228640524    | RNA5S14 |
| chr1       | 228642371      | 228642791    | RNA5S15 |
| chr1       | 228644494      | 228645211    | RNA5S16 |
| chr1       | 228644494      | 228645211    | RNA5S16 |
| chr1       | 228645631      | 228646047    | RNA5S17 |
| chr1       | 229644571      | 229644673    | URB2    |
| chr1       | 230004419      | 230004692    | RP11-552D4.1 |
| chr1       | 230082916      | 230083446    | GALNT2  |
| chr1       | 230082916      | 230083446    | GALNT2  |
| chr1       | 230082916      | 230083446    | GALNT2  |
| chr1       | 230082916      | 230083446    | GALNT2  |
| chr1       | 230871954      | 230872106    | C1orf198 |
| chr1       | 231563575      | 231563898    | TSNAX   |
| chr1       | 232946967      | 232947081    | NTPCR   |
| chr1       | 233002415      | 233004089    | PCNXL2  |
| chr1       | 233049988      | 233051439    | PCNXL2  |
| chr1       | 233134493      | 233134723    | PCNXL2  |
| chr1       | 233233319      | 233233457    | PCNXL2  |
| chr1       | 234640596      | 234640756    | RP4-781K5.9 |
| chr1       | 235447913      | 235448140    | TBCE    |
| chr1       | 235586922      | 235587304    | GNG4    |
| chr1       | 235587634      | 235587808    | GNG4    |
| chr1       | 235587634      | 235587808    | GNG4    |
| chr1       | 235682179      | 235682299    | LYST    |
| chr1       | 236170806      | 236171072    | GPR137B |
| chr1       | 236390017      | 236390622    | EDARADD |
| Chromosome | Start Base | End Base | Transcript ID   | Gene Symbol |
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| chr1       | 236857158  | 236857279| ENST00000366576| MTR         |
| chr1       | 237291630  | 237291841| ENST00000360064| RYR2        |
| chr1       | 237868172  | 237868591| ENST00000450451| RP11-193H5.1|
| chr1       | 237922047  | 237922530| ENST00000450208| RP11-193H5.2|
| chr1       | 239510121  | 239510171| ENST00000481779| CHRM3       |
| chr1       | 240022911  | 240023168| ENST00000447095| FMN2        |
| chr1       | 240895747  | 240896087| ENST00000446183| RGS7        |
| chr1       | 241684755  | 241684918| ENST00000437684| WDR64       |
| chr1       | 241878454  | 241878606| ENST00000521202| EXO1        |
| chr1       | 242300520  | 242300595| ENST00000536534| PLD5        |
| chr1       | 243938630  | 243938776| ENST00000440494| RP11-278H7.1|
| chr1       | 244601757  | 244602042| ENST00000415043| CYCSP5      |
| chr1       | 244640838  | 244640937| ENST00000487449| C1orf101    |
| chr1       | 244691192  | 244691264| ENST00000418162| DESI2       |
| chr1       | 244968370  | 244968759| ENST00000607453| RP11-156E8.1|
| chr1       | 245078339  | 245078712| ENST00000427529| EFCAB2      |
| chr9       | 2927177    | 2927428  | ENST00000426329| CARM1P1     |
| chr9       | 3340112    | 3340649  | ENST00000382004| RFX3        |
| chr9       | 3341208    | 3341283  | ENST00000382004| RFX3        |
| chr9       | 3861693    | 3861820  | ENST00000324333| GLIS3       |
| chr9       | 5179300    | 5179863  | ENST00000381641| INSL6       |
| chr9       | 5685755    | 5685837  | ENST00000545641| RIC1        |
| chr9       | 19418605   | 19418718 | ENST00000340967| ACER2       |
| chr9       | 22743595   | 22743900 | ENST00000453177| CLIC4P1     |
| chr9       | 33736566   | 33736816 | ENST00000422764| LINC01251   |
| chr9       | 36058139   | 36058556 | ENST00000479053| RECK        |
| chr9       | 41229400   | 41230423 | ENST00000612572| MIR4477A    |
| chr9       | 41316706   | 41316848 | ENST00000618030| RP11-187C18.5|
| chr9       | 41945108   | 41945737 | ENST00000618777| CNTNAP3B    |
| chr9       | 62799226   | 62799877 | ENST00000427509| LINC01410   |
| chr9       | 62799226   | 62799877 | ENST00000427509| LINC01410   |
| chr9       | 63818790   | 63818845 | ENST00000455245| DUX4L50     |
| chr9       | 67723662   | 67724532 | ENST00000617851| RP11-12A20.6|
| chr9       | 87743961   | 87744682 | ENST00000410476| AL160279.1  |
| chr9       | 92866866   | 92867054 | ENST00000395505| ZNF484      |
| chr9       | 94791324   | 94791434 | ENST00000428313| C9orf3      |
| chr9       | 95958750   | 95958975 | ENST00000470362| ERCC6L2     |
| chr9       | 98798035   | 98798216 | ENST00000471846| ANKS6       |
| chr9       | 110982396  | 110982517| ENST00000374431| LPAR1       |
| chr9       | 112127237  | 112127287| ENST00000355396| SUSD1       |
| chr9       | 121895479  | 121896014| ENST00000373778| TTL11       |
| chr9       | 124585467  | 124585590| ENST00000487099| NRR6A       |
| chr9       | 129478665  | 129478723| ENST00000578012| AL353803.1  |
chr9  130325224  130325288  ENST00000611173  HMCN2
chr9  130841823  130842070  ENST00000318560  ABL1
chr9  131726547  131726721  ENST00000484033  RN7SL328P
chr9  132010769  132010922  ENST00000357028  MED27
chr9  132577322  132577430  ENST00000263610  BARHL1
chr9  132799760  132799810  ENST00000476719  AK8
chr9  133392570  133392697  ENST00000462310  STKLD1
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chr9  133791953  133792566  ENST00000406606  VAV2
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chr9  133851677  133852006  ENST00000406606  VAV2
chr9  134141220  134141351  ENST00000358625  WDR5
chr9  134550017  134550299  ENST00000446184  RP11-473E2.3
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chr9  134684930  134685982  ENST00000469093  COL5A1
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chr9  135091542  135091960  ENST00000371793  OLFM1
chr9  136010668  136010902  ENST00000371793  NACC2
chr9  136427638  136428349  ENST00000471502  RP11-216L13.18
chr9  136802898  136803109  ENST00000471502  RP11-216L13.18
chr9  136802898  136803109  ENST00000471502  RP11-216L13.18
chr9  136810613  136810725  ENST00000357466  RABL6
chr9  136810613  136810725  ENST00000357466  RABL6
chr9  136810613  136810725  ENST00000357466  RABL6
chr9  137466521  137466894  ENST00000492278  PNPLA7
chr9  138056856  138056906  ENST00000371355  CACNA1B
chr8  13256459  13256804  ENST00000509922  DLC1
chr8  22963915  22964156  ENST00000522278  PEBP4
chr8  26778777  26778917  ENST00000380586  ADRA1A
chr8  30920636  30920832  ENST00000523019  RP5-1009N12.1
chr8  32188788  32188940  ENST00000517937  NRG1
chr8  39482120  39482329  ENST00000460383  ADAM3A
chr8  49944544  49944602  ENST00000521316  SNTG1
chr8  49944544  49944602  ENST00000521316  SNTG1
chr8  54331803  54331875  ENST00000362342  RNU105C
chr8  54331803  54331875  ENST00000362342  RNU105C
chr8  63935893  63935943  ENST00000523191  RP11-32K4.1
chr8  67139120  67139885  ENST00000508335  RP11-453N18.1
| chr8                              | 68001847 | 68002013 | ENST00000517617 | PREX2 |
|-----------------------------------|---------|---------|----------------|-------|
| chr8                              | 69127654| 69127841| ENST00000520239| GS1-44D20.1 |
| chr8                              | 73218849| 73219129| ENST00000518337| RP11-956J14.2 |
| chr8                              | 85643266| 85643610| ENST00000604378| REXO1L8P |
| chr8                              | 92031740| 92031918| ENST00000613886| RUNX1T1 |
| chr8                              | 99336999| 99337374| ENST00000522802| VPS13B |
| chr8                              | 99808339| 99808551| ENST00000523025| RP11-402L5.2 |
| chr8                              | 12036323| 120363464| ENST00000440844| COL14A1 |
| chr8                              | 121093480| 121093740| ENST00000517739| RP11-369K17.1 |
| chr8                              | 124874253| 124874363| ENST00000528090| LINC00964 |
| chr8                              | 133194708| 133195127| ENST00000220856| WISP1 |
| chr8                              | 139757038| 139757130| ENST00000389328| TRAPPC9 |
| chr8                              | 144234495| 144234558| ENST00000544576| MROH1 |
The four- or five-track NEIL3 i-motif stabilities were determined. The stabilities for these sequences were determined by folding the sequences in Britton-Robinson buffer (lithium salts of 20 mM phosphate, 20 mM acetate, and 20 mM borate doped with 140 mM KCl) preadjusted to pH values 5.0 to 8.0 in increments of 0.25. The i-motifs were folded by direct addition of the sequences to each buffer studied allowing folding to occur for 30 min followed by CD analysis (see figure on this page). The CD intensities at 286 nm were plotted as a function of pH to obtain the titration curve that was fit to the Henderson-Hasselbalch equation to determine the transition pH (pHT), which is a value that reports on the stability of the fold. The five-track NEIL3 i-motif had a pHT = 5.7 ± 0.2 and the four-track NEIL3 i-motif had a pH T = 5.3 ± 0.3. These values are consistent with a previous report from our laboratory. Previous our lab studied model i-motifs and found those with purine-rich loops were the least stable, and inspection of the NEIL3 i-motif sequences identify loops rich in purines supporting the low stabilities measured for these sequences.

Four-track NEIL3 i-motif = 5′-GG CCCC G CCC AGG CCCC G CCC AA

Five-track NEIL3 i-motif = 5′-GG CCCC G CCC AGG CCCC G CCC AAACAGCA CCC TA
References

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